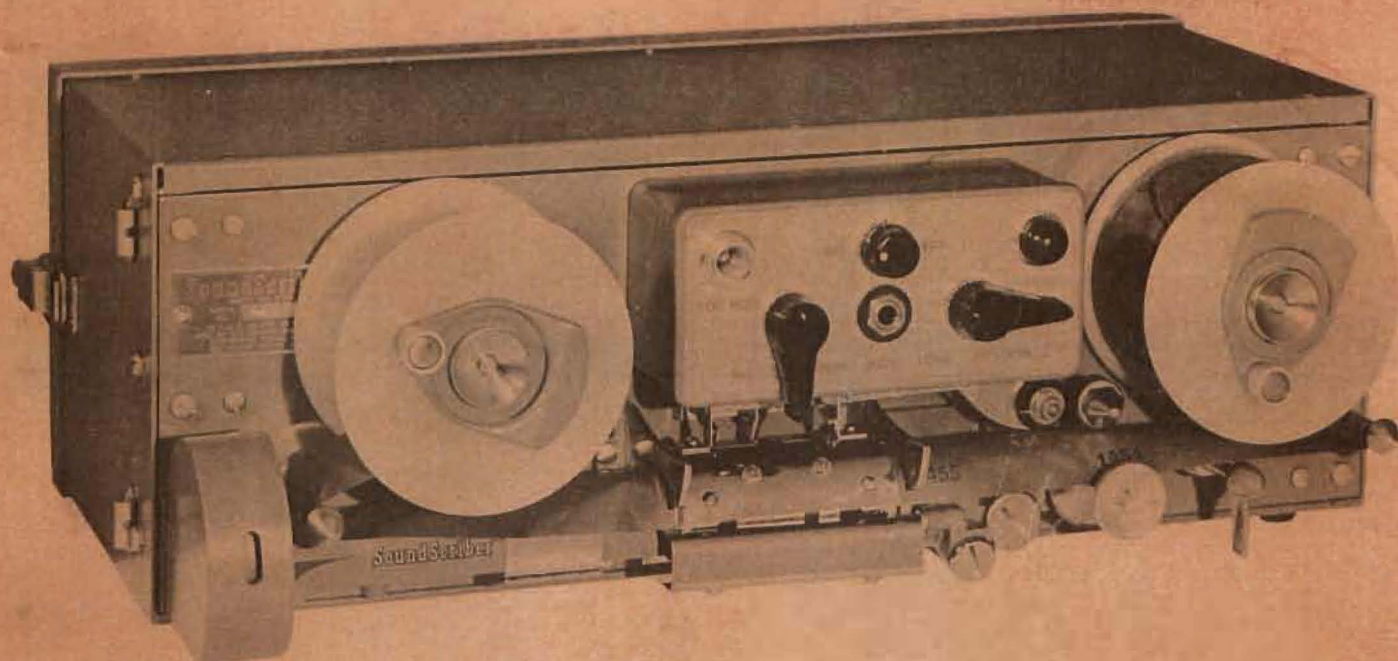


SOUND SCRIBER

MAGNETIC RECORDING EQUIPMENT



SERVICE MANUAL

Manufactured For Western Electric
by
The SoundScriber Corporation

Model S-124
(NAVY RD 217/UNH)

COPY

WESTERN ELECTRIC

KS-16746, L1 - L 2

Addendum and Revisions Applicable to the KS-16746-L1 and L2 Recorder-Reproducers and the KS-16747-L1 Demagnetizer-Case 38599

1. Toggle Switch located between Volume Indicator and Volume Control for starting and stopping motor.
2. Warning - Watches and meters may be damaged if placed near the KS-16747-L1 Demagnetizer.

3. Wherever use of a microphone is called for in the manual to adjust or to test the operation of the machine, the following procedure shall be followed.

An input to 1000 cycles, $0.1 \pm .02$ volts shall be applied to input terminal 7 and 8. The recording potentiometer shall be set at the line marked on the panel. The AVC switch shall be in the "ON" position. On reproduction, after making the tuning adjustment, the output voltage across a 4 ohm load shall be 1.0 ± 0.4 volts for the same gain setting as was used in recording. The 1000 cycle tone shall be free from interruptions and the output level shall not vary more than + 3 db. The above measurements shall be made previous to installation.

4. Electron tubes shall be replaced as required and not at the stated fixed intervals.

5. The recommended spare parts stock list on page 33 shall be reduced. The parts numbered 090047 to 260236 need not be stocked.

6. In Section X - Lubrication and Maintenance Instructions, all except the first paragraph on page 36, 37, and 38 shall be disregarded.

7. The 6 X 4 rectifier tube is replaced by a silicon rectifier so that the life will be extended and the temperature reduced.

8. The references to parts and repairs of previous models shall be disregarded.

9. KS-16326-L1 Oil may be used where Sacony Vacuum DTE light oil is specified.

10. KS-7471 Grease may be used where Standard Oil Beacon #325 grease is specified.

11. Standard Bell System tools may be used instead of the tools specified on page 31.

12. Soundcraft "MAGNA-SEE" may be used instead of the "VISIMAG" specified on page 55 and 56. "MAGNA-SEE" may be procured from local radio supply stores.

13. Old grease and oil shall be removed with a KS-2423 Twill Jean Cloth before applying new grease or oil.

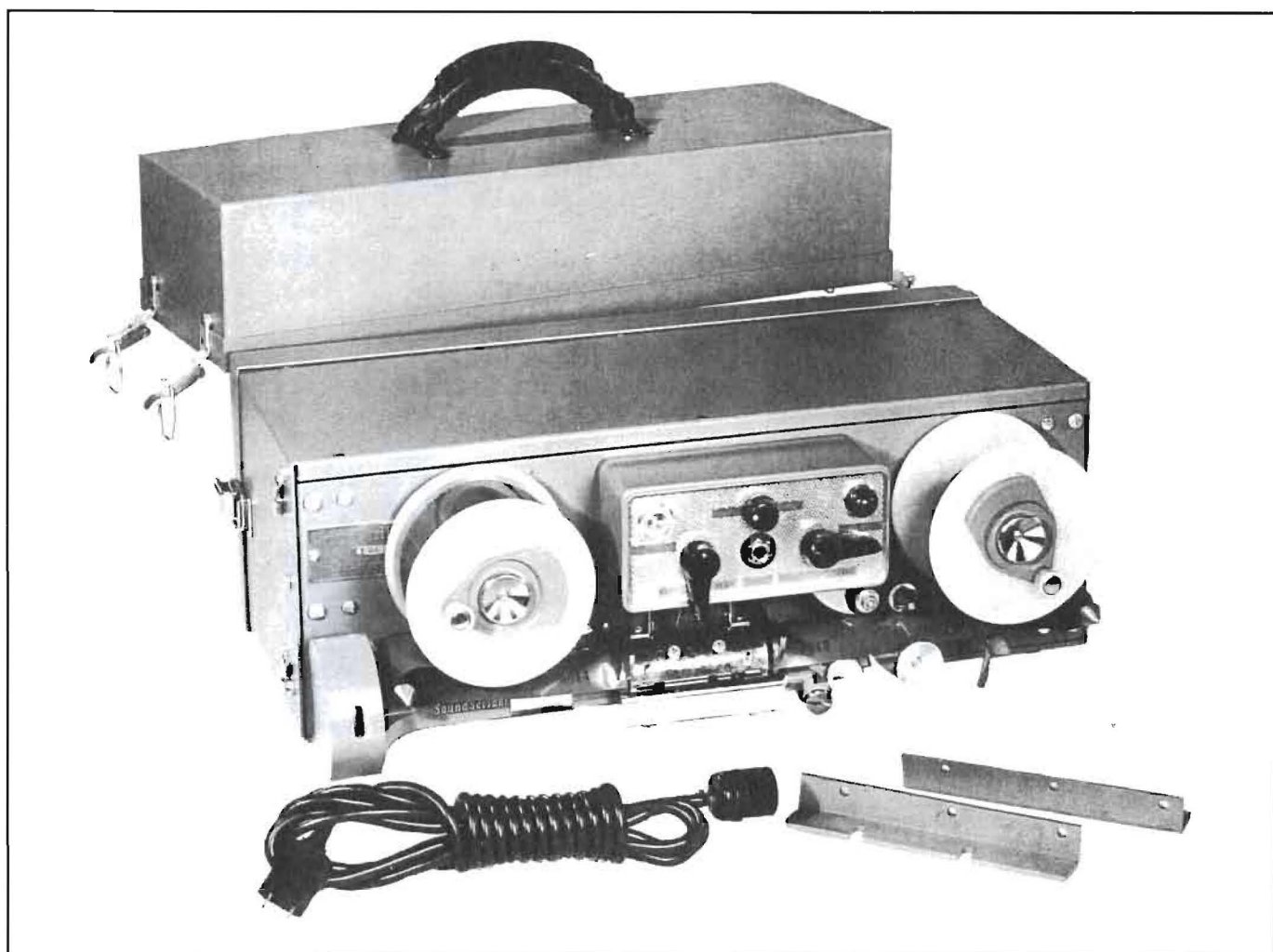
14. The flutter test specified on page 16 (m) is not required.

15. Magnetic Recording Wheel - The magnetic recording wheel shall be changed as required. The need for replacement may be determined by observing the transmission quality. Excessive loss of high frequency response or intermittent output is indication that the magnetic recording wheel should either be repolished or replaced.

16. A Hewlett-Packard 400-D V.T. Voltmeter or equivalent may be used where the Ballentine 300 Voltmeter is specified.

17. A 52 type headset or equivalent may be used where a 500 ohm headset is specified.

SERVICE MANUAL



MODEL S-124 TAPE RECORDER-REPRODUCER

GENERAL INFORMATION

This service manual has been revised to be applicable to machines starting with serial number 420600, as of January 1, 1959.

The manual has been divided into Fifteen Sections, each Section containing information pertaining to various service procedures and closely allied subjects, an index follows this page which lists the starting page of each section and the page number of each illustration.

To simplify locating any section, and to make allowances for future changes, or additions, the sections of this manual are started on a right hand facing page.

Any changes to the machine, which may alter the instructions contained herein, will be furnished as revised pages, which should replace the original, or as printed additions to their respective sections.

Should any question arise concerning service problems not covered in this manual, please write to:

The SoundScriber Corporation
6 Middletown Avenue
North Haven, Connecticut
Attention: Service Department

Include the Model Number and Serial Number of the machine in question, plus a complete description of the particular problem.

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SECTION I

SPECIFICATIONS

Operating Voltage.....	105-125 Volts, 60 cycles.
Power Consumption.....	60 Watts
Overall Frequency Response.....	Down no more than 8 db, at 200 and 3500 cycles, from 1000 cycle reference point.
Magnetic Recording Head.....	Single magnetic recording wheel assembly, containing two magnetic heads wired in series, for both RECORD and PLAYBACK.
Erase.....	5-10 second bulk erasure of entire reel of tape with accessory Model BE-24 Tape Demagnetizer.
Tape Feed Speed.....	2.520 inches per minute.
Magnetic Recording Wheel Assy. Speed....	30 RPM.
Method of Recording.....	Transverse (across tape surface).
Recording Medium.....	Magnetic tape, 2 inches wide, with .0015 inch mylar base. Tape wound on 3-3/4 inch diameter reel, and accurately stamped with time in minutes, from 0000 to 1455, on uncoated surface.
Maximum Uninterrupted Recording Time....	Twenty-four hours plus 15 minute overtime allowance.
Rewind Method.....	Manual (approximately 2 minutes time required to rewind entire reel).
Minimum Input Levels for Fully Modulated recording.....	12000 ohm line .002 Volts 12000 ohm telephone .002 Volts 50 ohm microphone 20 M.V.
Outputs.....	Playback output jack for exter-

nal 3 to 16 ohm speaker (automatically disconnecting inbuilt speaker), and monitor jack for 500 ohm headset (for monitoring input signal while recording).

Maximum Playback Power Output.....Two watts through inbuilt speaker (or externally connected 4 ohm speaker).

Automatic Volume Control.....Switch located in rear of machine to switch AVC In or Out of circuit during RECORD. AVC automatically disconnected during PLAYBACK.

Maximum Flutter and Wow.....0.7%.

Signal to Noise Ratio.....31 db.

Weight.....26½ lbs.

Dimensions.....Height 6½", Width 18-1/8", Depth 11-7/8".

Rack Mounting.....Can be rack mounted, with brackets supplied, in standard 19" rack.

SECTION II

INSTALLATION AND OPERATING INSTRUCTIONS

The Model S-124 Twenty-Four Hour Single Channel Magnetic Tape Recorder-Reproducer has been engineered and designed to perform the specific task of continuously recording any desired communication signal, over any period of time up to 24 hours, without tape change. In addition, the time in minutes from 0000 to 1455 (24 hours, plus a 15 minute overtime allowance) has been precision printed on the back side (uncoated surface) of the tape, allowing synchronization with any 24-hour timing device. The Type ST-124 reels of magnetic tape used are small in bulk (3-3/4" in diameter and 2 1/4" thick) allowing them to be stored conveniently. They can be bulk erased in approximately 5-10 seconds with the Model BE-24 Demagnetizer.

The Model S-124 Magnetic Tape Recorder-Reproducer comes in a carrying case, consisting of a cabinet, bottom cover, and top cover with handle. A power cord, one empty tape reel, and two accessory mounting brackets for rack mounting are also included (see frontispiece). The tape recorder consumes 60 watts, and is designed to be used on a 105-125 volt, 60 cycle source. It weighs only 26 1/2 pounds, including case and full reel of magnetic tape, thus allowing it to be easily transported. All the controls of the magnetic tape recorder (except the AVC switch) are conveniently located on the front panel. Operation is simple and foolproof, if the instructions outlined below are followed, and the machine, which contains no rubber belts to wear and whose moving parts operate at extremely slow speeds, should give years of trouble free service.

INSTALLATION FIGS. 1, 21

Ideal site for Model S-124 Tape Recorder-Reproducer and extra reels of tape is a room where dust and dirt is at a minimum, temperature range is from 60-75 degrees fahrenheit, and relative humidity is 60% or less. Machine may be set on a bench, fastened securely to a bench, or mounted in a standard 19" rack.

To fasten machine securely to a bench, mechanical and electrical chassis assembly must first be removed from cabinet (see Section XI, Paragraph 4). Then, remove screws fastening four 260 149 rubber feet to 411 226 cabinet, drill four 5/32" holes in bench (refer to Figure 1 on following page), and, with cabinet set on its rubber feet over holes drilled in bench, fasten unit in place with screws and flat washers. Use 6-32 screws that are 1/2" long plus thickness of bench and flat washer. All four screw ends must tighten flush inside cabinet. Distance X in Figure 1 on following page must be 4-3/8 inches more than distance it is desired to have front of machine from front of bench. Be sure to provide room in rear of machine to permit access to

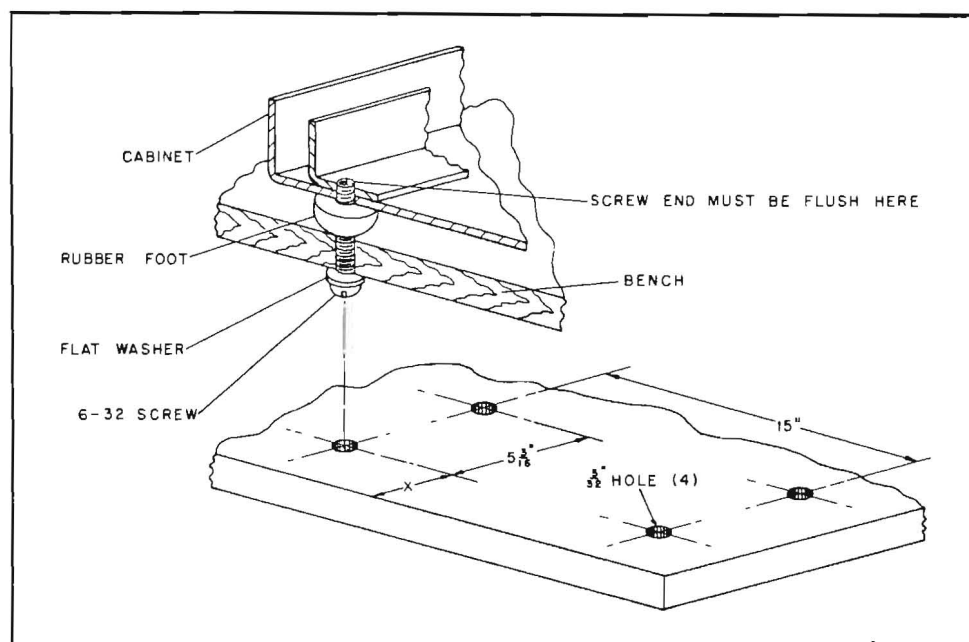


FIG. 1. Mounting Machine To Bench

Machine is designed to be operated with top and bottom covers of carrying case REMOVED.

LOADING FIG. 2

Remove handle cranks (A) from right and left reel spindles by unscrewing knobs in counterclockwise direction.

Facing front of machine, place empty reel (B) on right hand spindle. Fasten reel securely in place with handle crank, making sure key seats properly.

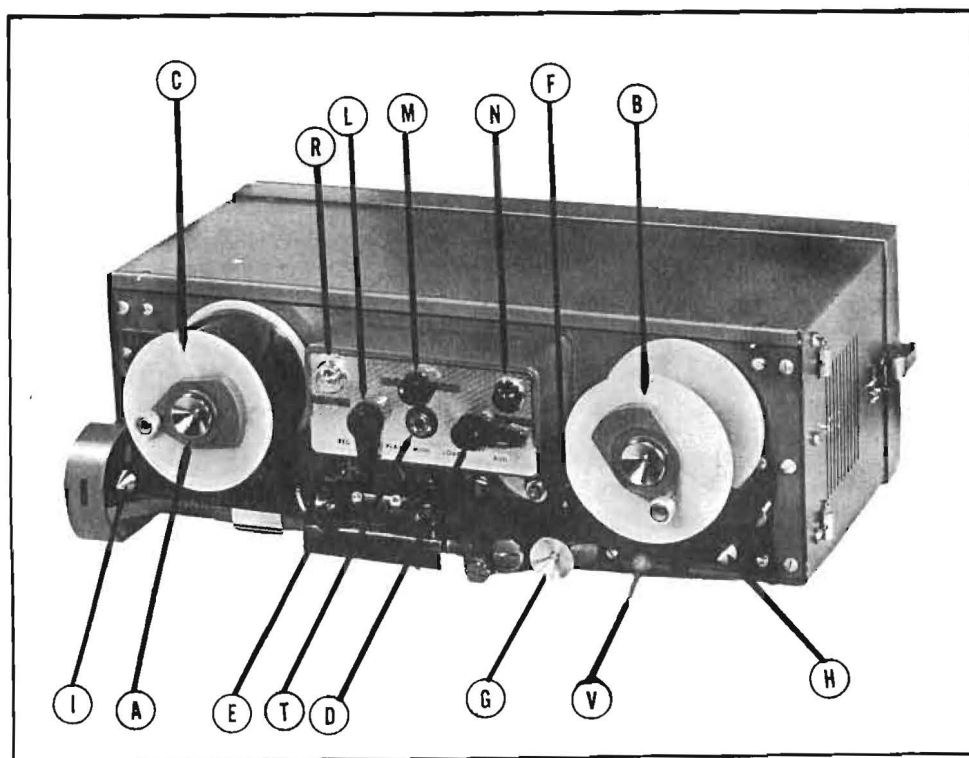


FIG. 2. Front Panel Controls

connections on rear panel.

To mount machine in standard 19" rack, remove 220 308 screws from right and left sides of cabinet, align 411 221 and 411 222 rack mounting brackets over same screw holes, and re-fasten screws in place (see Figure 14). Then, fasten rack mounting brackets to 19" rack. With this type of mounting arrangement, units can be stacked one atop the other.

Place erased reel of magnetic tape (C) on left hand spindle, such that, when tape is pulled from reel, reel moves in clockwise direction. Fasten reel securely in place with handle crank, making sure key seats properly.

Rotate LOAD lever (D) fully clockwise to LOAD position, as illustrated in Figure 2. This raises gate (E) up and away from magnetic heads, and rubber pressure roller (F) up and away from tape feed roller (G), allowing tape to be easily threaded.

Thread magnetic tape through machine as illustrated in Figure 2, attaching end of tape to hub of empty reel with adhesive tape (so that tape will wind on reel with glossy side out when reel is rotated in clockwise direction). Make sure tape is properly aligned in guides (H) and (I).

Wind magnetic tape on empty reel until 0000 time mark appears just before gate (E), and then rotate LOAD lever fully counterclockwise to RUN position. Note exact time 0000 time mark passes gate for future reference. Logging can then be done by noting time.

RECORDING FIGS. 2, 3, 4

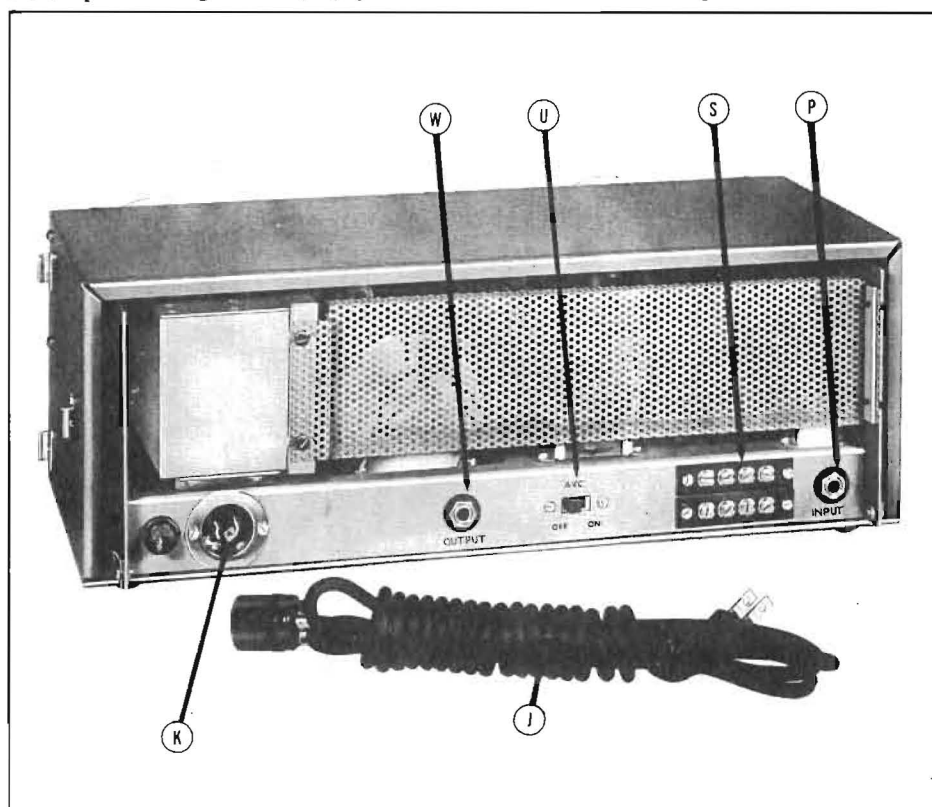
If magnetic tape recorder is to be permanently located in one spot, ground chassis of machine to a good earth connection.

Plug twist lock socket of power cord (J) into twist lock plug (K), located in rear of machine, and connect power plug into a 105-125 volt, 60 cycle source.

With REC-STOP-PLAY selector switch (L) in STOP position, turn OFF-VOL control (M) clockwise to turn power ON. Power indicator lamp (N) will light. Allow 30 seconds for warm-up.

Low Impedance Microphone (50 Ohms)

To record from a low impedance microphone, plug microphone into INPUT phone jack (P), located in rear panel of machine (see Figure 3).



Then, switch REC-STOP-PLAY selector switch to REC position (which automatically starts tape recorder motor) and, observing visual VOL-INDICATOR (R), adjust OFF-VOL control to obtain very light flash of lamp when speaking into microphone

Line (12,000 Ohms or Less)

To record from a line of 10,000 ohms impedance or less, connect signal to terminals marked LINE INPUT on terminal strip (S), found in rear of tape recorder (refer to Figures 3 and 4). Since it is not possible to record from LINE IN-

FIG. 3. Rear Panel Controls

PUT if a mike is plugged into INPUT phone jack, make sure INPUT phone jack is clear. Then, switch REC-STOP-PLAY selector switch to REC position (which again automatically starts tape recorder motor) and, observing visual VOL-INDICATOR (R), adjust OFF-VOL control to obtain flash of lamp when signal comes through. An accurate setting of recording level can be obtained by connecting a Model 300 Ballantine

Section II. Installation And Operating Instructions

voltmeter into MONITOR JACK (T) and adjusting OFF-VOL control so meter reads approximately $\frac{1}{2}$ volt (average). AVC Switch (U) must be switched

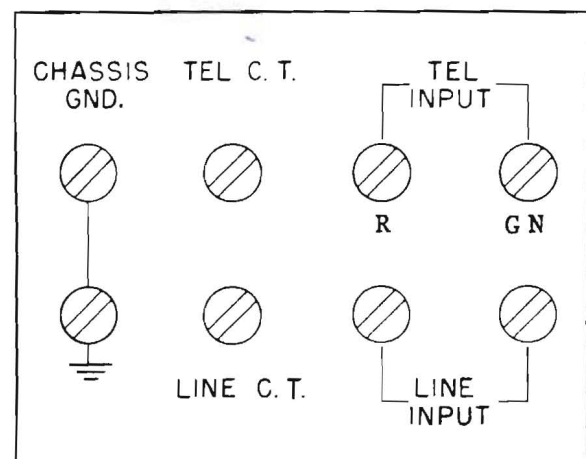


FIG. 4. Input Terminal Strip

OFF when making this adjustment. Refer to Section IV, Figure 6, for ground connections of various signal sources.

Telephone Recording

To record from a telephone, connect signal to terminals marked TEL-INPUT(R)(GN) on terminal strip (S), found in rear of tape recorder (refer to Figure 4). Then, follow instructions outlined in paragraph above to properly set up tape recorder controls.

SPECIAL NOTES

During all recording operations described above, MONITOR JACK (T) can be used to monitor incoming signal. A 500 ohm headset should preferably be used as monitoring device. No means of controlling monitored signal is provided.

Recording amplifier contains AVC circuit that can be switched ON or OFF with AVC switch (U), located on rear panel of machine (see Figure 3). Whenever AVC switch is turned ON, OFF-VOL control should be set at point where a strong signal records at a level where, when signal is played back, distortion is acceptable. With gain control set at this point, low level signals 20-30 db. below high level signals will record satisfactorily. A few trials will probably be required before OFF-VOL control can be set at optimum point.

PLAYBACK FIG. 2

If playback is desired from tape presently on machine, first mark down time from tape where recording is left off before moving tape back, so tape can be easily returned to position slightly ahead of time mark for continuation of recording. Then, switch REC-STOP-PLAY selector switch to PLAY position to automatically start tape recorder motor.

- (A) If portion of tape desired to be played back is known, rotate LOAD lever (D) to LOAD position, wind back tape on left reel (facing machine) until desired time mark on tape appears on left side of gate, and then rotate LOAD lever to RUN position.

Adjust playback volume with OFF-VOL control (M), and align magnetic heads with recording tracks on tape by adjusting TUNING lever (V). Fast forward SCAN can be accomplished at this time by rotating knurled knob of tape feed roller (G) clockwise. This knob can also be rotated counterclockwise for short repeats. While performing a repeat operation, slack tape must be taken up manually by rotating left hand feed reel counterclockwise.

- (B) If portion of tape desired to be played back is not known, rotate LOAD lever toward LOAD position until rubber pressure roller (F) releases tape. Then, holding LOAD lever in this position, wind back tape on left reel until garbled sound is heard. At this point, rotate LOAD lever back to RUN position

and adjust for playback as described in paragraph A above. Repeat this operation if necessary.

If playback is desired from reel of tape not on machine, follow instructions outlined below:

If reel of partially used tape is on machine, note time of last recording, switch REC-STOP-PLAY Selector Switch to PLAY position, rotate LOAD lever to LOAD position, and wind back tape on left reel. Then, switch REC-STOP-PLAY selector switch to STOP position.

Remove handle cranks and both reels from reel spindles.

Place empty reel on LEFT HAND spindle. Fasten reel securely in place with handle crank, making sure key sets properly.

Place recorded reel of tape on RIGHT HAND spindle, such that, when tape is pulled from spindle, reel moves in counterclockwise direction. Fasten reel securely in place with handle crank, making sure that key seats properly.

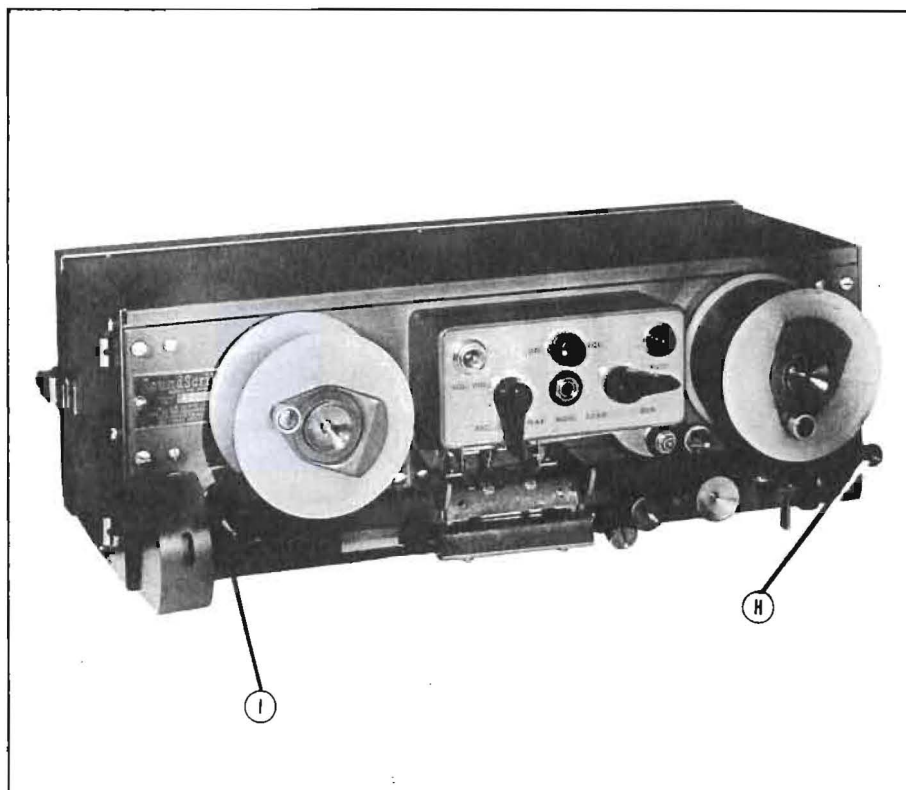


FIG. 5. Reels of Tape

Thread magnetic tape "back" through machine as illustrated in Figure 5, attaching end of tape to hub of empty LEFT HAND reel with adhesive tape (so that tape will wind on reel, glossy side out, when reel is rotated in counterclockwise direction). Make sure

tape is properly aligned in guides (H) and (I). Finally, switch REC-STOP-PLAY selector switch to PLAY position. Now, proceed as previously described in paragraph A or B.

SPECIAL NOTE

An external 3-16 ohm speaker or a 500 ohm headset can be used in lieu of speaker in tape machine. Merely plug external listening device into OUTPUT phone jack (W), found in rear of machine (see Figure 3). Speaker in tape machine automatically disconnects.

SECTION III

CHECKING MACHINE RECEIVED FROM FACTORY

The instructions outlined below describe the various checks which should be performed on a Model S-124 Tape Recorder-Reproducer when it is received from the factory (either in new condition or a repaired machine). Refer to Section II, Installation and Operating Instructions, when making the checks described below.

- (a) Unpack machine, making sure to remove 200 587 cardboard gate insert from between ramp assembly and gate shield. Save **pack-**ings from first few machines, so that any machine can be properly repacked if it is to be shipped or transported. When shipping or transporting a machine, always place a piece of tape between gate assembly and magnetic recording wheel assembly, lower gate assembly to RUN position, and insert 200 587 cardboard gate insert in place. If machine is shipped or transported with a full reel of tape, load tape on machine, lower gate assembly to RUN position, insert 200 587 cardboard gate insert in place, and tape up both feed reel and take-up reel, to prevent them from moving during shipment.
- (b) Remove top and bottom cover assemblies. Visually check machine for scratches, dents, and broken or loose parts. Then, load machine with erased reel of tape.
- (c) Connect power cord to machine and to 105-125 volt, 60 cycle power source.
- (d) Plug 50 ohm microphone, Electro-Voice Model 630 (or Turner Model U9S set on 50 ohm range) to INPUT phone jack, found in rear of machine. Turn AVC switch, also located in rear of machine, OFF.
- (e) Turn equipment ON Power indicator lamp should light.
- (f) Turn LOAD-RUN knob to LOAD position. Gate assembly should lift away from tape, and rubber pressure roller should lift away from large knurled knob of drive roller and shaft assembly.
- (g) Turn LOAD-RUN knob to RUN position. Gate assembly should drop back on tape and rubber pressure roller should press tape down on large knurled roller of drive roller and shaft assembly.
- (h) Turn REC-STOP-PLAY knob to REC position. Motor should start and tape should start feeding.

Section III. Checking Machine Received from Factory

- (i) Adjust OFF-VOL control to obtain very light flash of VOL-INDICATOR lamp when speaking into microphone with normal voice intensity. Make a one minute test recording.
- (j) Turn REC-STOP-PLAY knob to PLAY position. Motor should start and tape should start feeding.
- (k) Operate knob of drive roller and shaft assembly to move tape back to beginning of recording (rotate knob of drive roller and shaft assembly counterclockwise with RIGHT HAND and, at same time, take up slack tape by rotating feed reel counterclockwise with LEFT HAND).
- (l) Turn OFF-VOL control (now acting as PLAYBACK VOLUME control) up, and align recorded tracks on tape with playback heads by adjusting tuning lever to position where strongest playback signal is heard.
- (m) Check for good voice quality and minimum wow and flutter.
- (n) Plug a speaker into OUTPUT phone jack (located in rear of machine). Speaker in machine will be disconnected and external speaker should reproduce recorded signal.
- (o) Plug same speaker into MONITOR jack. Both this external speaker and speaker in machine should reproduce recorded signal.
- (p) Make a second test recording on machine, but this time with AVC switch ON and with OFF-VOL control set as described in RECORDING instruction portion of Section II, Installation and Operating Instructions. Check this recording for good quality and good AVC action.

The A.V.C action is good, when the high level signal is played back and the distortion level is low.

SECTION IV DESCRIPTION OF ELECTRICAL OPERATION

I. Amplifier Circuit.

The Model S-124 Tape Recorder-Reproducer is a SINGLE CHANNEL 24 hour Tape Recording machine, designed to RECORD from any of the following sources: a line of 12,000 ohms impedance or less, a telephone line, or a microphone of 50 ohms impedance. The machine can only be connected, however, to one of these signal sources at a time. The line or telephone signal is connected at the spade terminal strip assembly located in the rear of the machine. The microphone is connected to the input phone jack, also located in the rear of the machine. Refer to the Schematic Diagram, Figure 7 to follow the ensuing descriptions of the various circuits in the machine. This schematic diagram is the electrical diagram of machines Serial Number 420 600 and above. The voltage readings are therefore for a machine wired as per this diagram.

As an aid in physically locating any electrical component shown on the schematic, each part has been assigned a letter and number code, which corresponds to the same letter and number coding in the parts lists accompanying the drawings in the ILLUSTRATED PARTS BREAKDOWN section XIV.

As an assistance to the serviceman in understanding the operation of the amplifier circuit in the Model S-124 Tape Recorder-Reproducer, a signal to be RECORDED will be traced through the various circuits within the machine to its ultimate destination, the magnetic RECORDING heads. Then, this now RECORDED signal will be retraced through the machine to describe the PLAYBACK process. The RECORDING process is described first.

Assuming the signal source to be a line or telephone signal (the telephone input differs only in that it has four 0.1 Mfd. capacitors to prevent any flow of direct current), the signal must be connected to the proper spade terminals on the terminal strip assembly in the back of the machine. There are three possible grounding conditions of the signal source as shown in Figure 6 on the following page. Figure 6A shows an ungrounded signal source, and therefore no ground connection need be made. It is possible however, that connecting the CT. terminal in the tape recorder to ground (dotted connection) may give a lower hum level. Figure 6B shows a signal source with one side grounded, and therefore the terminal to which this lead is connected in the tape recorder should also be grounded. Figure 6C shows a signal source with a grounded center tap, and therefore the C.T. terminal in the tape recorder should also be connected to ground.

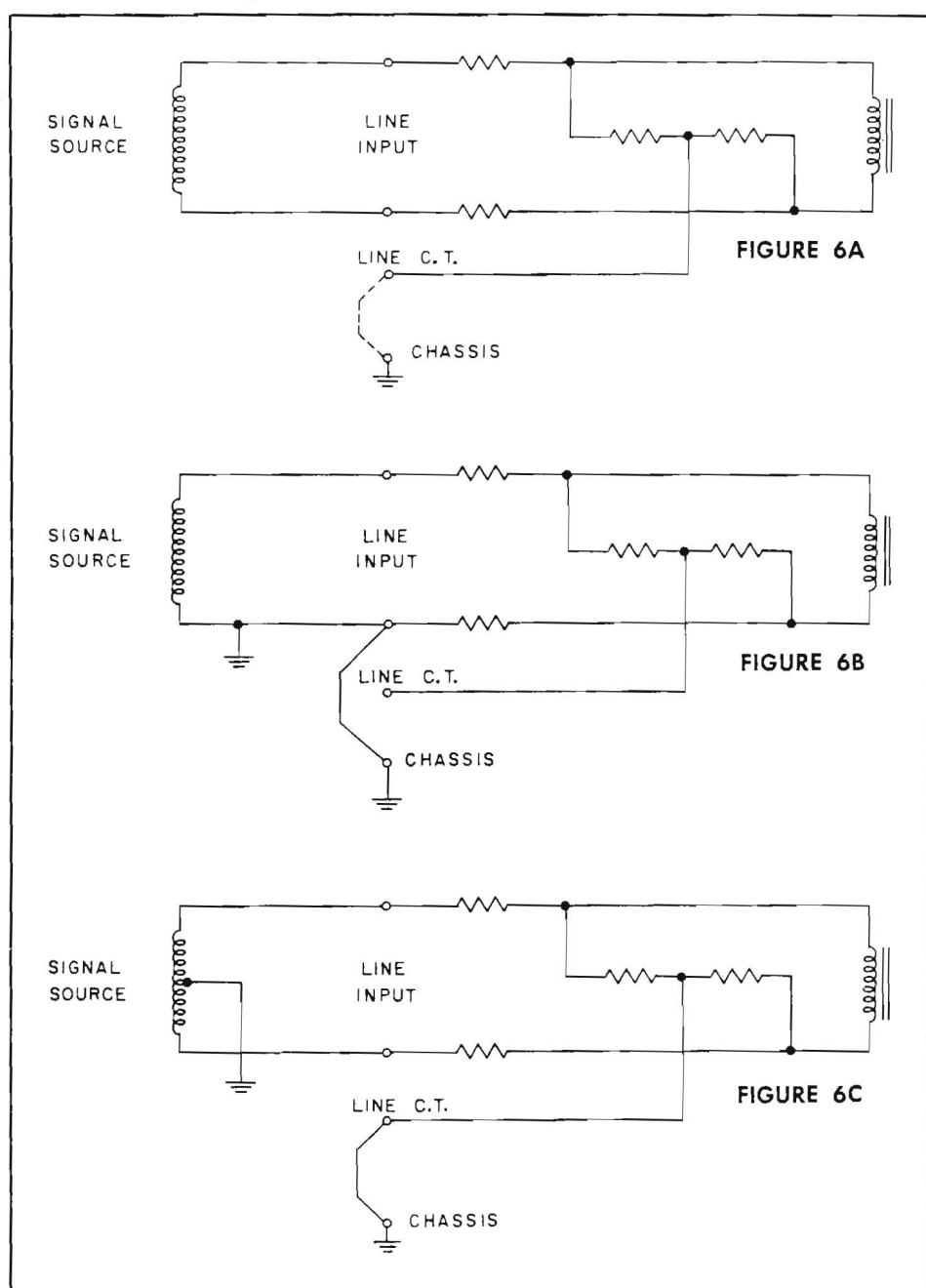


FIG. 6. Input Connections to Machine

the AVC circuit. The AVC circuit is described separately in paragraph 2 in this same section.

The portion of the signal that goes to the magnetic heads is taken off the plate of the 6AQ5 V3 power output tube and fed through a filtering network consisting of a .01 Mfd capacitor, a 100K resistor and .001 Mfd. capacitor connected in parallel, and a .022 Mfd. capacitor. This filter network allows the signal to be recorded to pass through but blocks out the 27-30 KC oscillator signal. The signal output from this filter network then passes through one half of the oscillator coil, through the #2 section of deck B of the selector switch, and finally through the magnetic RECORDING heads.

The signal from the plate of the 6AQ5 V3 power output tube also passes through a 170 143 output transformer to a 150 149 monitor jack, and

Now, with the selector switch turned to the RECORD position, the signal will pass through a 170 100 line matching transformer, the 5K portion of a two section ganged 210 451 volume control, a 150 368 input phone jack, the #1 section of deck C of the 130 130 selector switch (shown in the schematic diagram in the RECORD position), and a 170 142 input transformer to the grid of the first voltage amplifying stage. Here the signal is amplified by a dual 12AT7 V1 tube, sent through the 500K portion of the two section ganged volume control, and applied to the grid of the second voltage amplifying stage. Again the signal is amplified, this time by the dual 12AT7 V2 tube, and applied to the grid of the single ended power stage. The signal from the plate of the 6AQ5 V3 power tube is then split and fed to 1) the magnetic heads, 2) the 170 143 output transformer, and 3)

through the #1 section of deck A of the selector switch to a 210 447 2.7 ohm resistor. This resistor is a loading resistor which reflects back the proper impedance to the primary of the output transformer during RECORD only. In regards to the monitor jack, since there is no monitor volume control, the proper monitoring volume will be obtained only when using a 500 ohm headset. With any other listening device, it would be advisable to use an adjustable voltage dividing network between the monitor jack and the listening device.

When the selector switch is turned to the PLAYBACK position, the #1 section of deck B of the selector switch grounds the output of the oscillator. The magnetic RECORDING heads, now acting as PLAYBACK heads, pick up the RECORDED signal from the tape, and this signal passes through the #2 section of deck B and #1 section of deck C of the selector switch, and through the 170 142 input transformer to the grid of the first voltage amplifying stage. Here the playback signal is amplified by the dual 12AT7 V1 tube, and sent to a tone control circuit, consisting of a .01 Mfd. capacitor and 15K resistor, connected in series to ground through the #3 section of deck C of the selector switch. This tone control circuit attenuates some of the higher frequency signals. The remainder of the signal then passes through the 500K portion of the two section ganged volume control (which now acts as a PLAYBACK volume control) and is applied to the grid of the second voltage amplifying stage. Here the signal is amplified by the dual 12AT7 V2 tube and applied to the grid of the single ended power stage. The signal is then fed through the 170 143 output transformer, through the #1 section of deck A of the selector switch, and through the 150 368 output jack to the playback speaker. If an external 3-16 ohm speaker is plugged into the output jack, the playback speaker in the machine will be automatically disconnected from the circuit. The monitor jack still remains connected across the secondary winding of the output transformer during PLAYBACK and can be used during PLAYBACK if it is desired to connect an external speaker to the tape recorder from the front of the machine.

2. Automatic Volume Control Circuit.

The amplifier of the Model S-124 Tape Recorder-Reproducer has an automatic volume control circuit that can be used during the RECORDING process to provide a somewhat constant output signal to the magnetic heads despite up to 30 db. variations in the input signal. The automatic volume control circuit can be disabled during RECORD if desired by closing the 130 131 AVC switch and thus grounding the D.C. bias voltage. The AVC circuit is automatically disabled (the D.C. bias voltage grounded) by the #2 section of deck C of the selector switch during PLAYBACK. The AVC action is obtained by taking a portion of the audio signal from the plate of the 6AQ5 V3 output tube, rectifying it (in a voltage doubling circuit), filtering the resulting negative D.C. voltage derived from the rectifiers, and feeding this negative D.C. voltage to both grids of the 12AT7 V1 first stage amplifier tube. Under strong audio signal conditions, a large negative D.C. voltage is derived by the AVC circuit and is impressed upon these grids, changing the operating point of the tube, and reducing the overall gain of the tube. Under weak audio signal conditions, a small negative voltage (or none at all) is derived by the AVC circuit and the tube gain remains unchanged. In this way, the audio signal appearing across the magnetic heads is more nearly constant than it would be if the amplifier had no AVC at all. To properly use the Tape Recorder when the AVC circuit is being used, the gain control should be set at a point where the strong-

est signal will record at a level where, when the signal is played back, the distortion is acceptable. With the gain control set at this point, a low level signal 20-30 db. below the high level signal will record satisfactorily. A few trails will probably be required before the gain control can be set at the optimum point.

3. 411093 Magnetic Recording Wheel Assembly.

The 411 093 magnetic recording wheel assembly consists of two small magnetic heads wired in series. These two heads are used for both RECORDING and PLAYBACK. The entire recording wheel assembly must be replaced when the heads wear down or one or both heads become defective. The reason for this is that both heads must be properly aligned (height-the head protrudes above the wheel assembly), and they must be within 3 db. of each other in overall level (RECORD and PLAYBACK).

It is recommended that the magnetic recording wheel assembly be replaced at least once every six months under continual 24 hour usage. This represents over 2000 hours that each magnetic head has been in contact with the tape surface, and by this time the projection of the two heads above the tape guide ring on the magnetic wheel assembly will be practically worn off. Further wear on the heads will eventually result in a condition where the tape only contacts the heads occasionally or not at all.

A final important note to remember, in regards to the magnetic recording wheel assembly, is that weak and distorted recordings will occur if the bias oscillator should fail. Refer to Section XII, Paragraph 5, for the method of checking and adjusting the bias current.

4. Oscillator Circuit.

The oscillator stage, a tuned plate type, is a fixed frequency oscillator which gives out a signal somewhere in the range of 27-30 Kilocycles, the variation of which is due to the tolerances of the components used. Without this AC bias current flowing through the magnetic heads during RECORD, a weak and distorted recording will result.

The bias current that flows through the magnetic heads during RECORD is factory set at 6 milliamps (.006 amps). This current is controlled by a 210 492 30K potentiometer, located in the top upper amplifier chassis assembly. Refer to Section XII, Paragraph 5, for the method of checking and adjusting the bias current.

5. 411075 Motor. Sleeve Type Motor 411 266 Ball Bearing Type Motor

The motor is a synchronous, permanent split capacitor type which uses a 1.5 Mfd. starting capacitor. It operates on a 105-125 volt, 60 cycle source only, and runs at 1800 RPM. It is firmly fastened to a motor mounting bracket, which is in turn shock mounted to reduce the transmission of motor vibration to either the mechanical or electrical system of the machine. If it is ever necessary to change the motor, be sure to replace the color coded leads exactly as per the schematic diagram. Deck A, the shorting type section of the 130 130 tape recorder selector switch, operates the motor. The motor operates whenever this switch is in the RECORD or PLAYBACK positions.

SECTION V

DESCRIPTION OF MECHANICAL OPERATION

The Model S-124 Tape Recorder-Reproducer is a SINGLE CHANNEL 24 hour tape recording machine. To design such a machine, capable of RECORDING continuously for a 24 hour period and yet be moderate in size, the method of RECORDING used by conventional tape machines could not be used. The result is the unusual design feature of having revolving magnetic heads that RECORD transverse across the surface of 2" wide tape. The tape is formed into an arc by a special gate assembly, so that it will conform with the path followed by the revolving magnetic heads. With this type design, a continuous 24 hour recording time is obtained by using a 3-3/4 inch diameter reel, with the tape feeding past the recording heads at a 2.520 inch per minute speed. Of course, the frequency response of the machine does not extend into the extreme lower or higher frequency areas as do conventional tape machines. However, the frequency response is adequate for any type voice communication RECORDING.

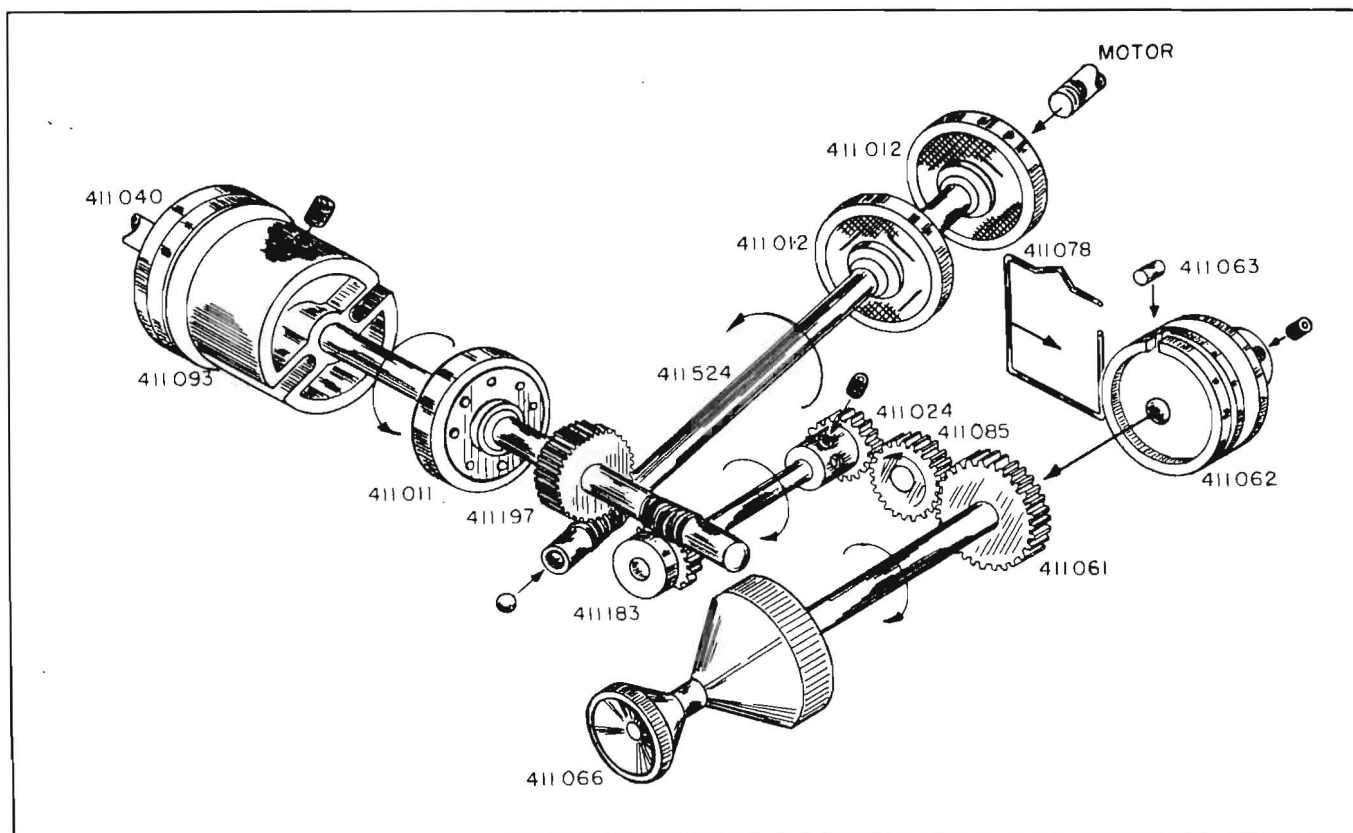


FIG. 8. Mechanical Drive System

Section V. Description of Mechanical Operation

The power to operate the mechanical system of the Model S-124 Tape Recorder-Reproducer is obtained from a single synchronous, permanent split capacitor motor. Referring to Figure 8, on the preceding page, the motor is connected to the 411 524 worm drive shaft through two 411 012 flexible couplings. These couplings reduce the transmission of motor vibration to the magnetic recording wheel assembly, and eliminate the need for critical motor mounting, which would be necessary if the motor were directly coupled to the 411 524 worm drive shaft. Geared to the threads of the worm drive shaft is a 411 197 30 RPM drive gear, whose left end (facing the front of the machine) is fastened to a 411 040 flywheel and shaft assembly, through a 411 011 flexible coupling. This flexible coupling filters out any low and high speed variations (wow or flutter) in the gear cluster, while the heavy flywheel on the end of the flywheel and shaft assembly maintains a constant 30 RPM speed of this assembly. The 411 093 magnetic recording wheel assembly is attached to the shaft of the 411 040 flywheel and shaft assembly and thus rotates at a speed of 30 revolutions per minute.

Geared to the worm threads on the right end of the 411 197 30 RPM drive gear (facing the front of the machine) is a 411 183 gear and shaft assembly. The shaft of this gear protrudes out the back of the gear box, and a 411 024 spur gear is fastened to it. This 411 024 spur gear meshes with a 411 085 intermediate spur gear, which in turn meshes with a 411 061 gear. This 411 061 gear fits into a 411 062 pulley, and this pulley is fastened to a 411 066 drive roller and shaft assembly, which is the tape drive mechanism. The 411 061 gear is not rigidly fastened to the 411 062 pulley, but is held by a 411 078 spring and a 411 063 dog, the dog being located between two teeth of the 411 061 gear in a special cut-out in the pulley. The 411 085 intermediate spur gear, the 411 061 gear, and the 411 062 pulley are all part of the tuning lever assembly. Figure 8, on the preceding page, illustrates all the above mentioned parts, the way they are assembled, and their direction of rotation.

Now, whenever the LOAD lever of the machine is placed in the RUN position, the 411 111 rubber pressure roller drops down and presses the tape against the large knurled roller of the 411 066 drive roller and shaft assembly. Then, when the motor of the machine is operated, the 411 524 worm drive shaft drives the 411 197 30 RPM drive gear, which drives the 411 040 flywheel and shaft assembly (and thus the 411 093 magnetic recording wheel assembly) and the 411 183 gear and shaft assembly. Since the 411 024 spur gear is fastened to the 411 183 gear and shaft assembly, it drives the 411 085 intermediate spur gear which in turn drives the 411 061 gear. The 411 061 gear, which is attached to the 411 062 pulley by a spring and roller dog arrangement, then drives the 411 062 pulley, which drives the 411 066 drive roller and shaft assembly, and thus the tape is driven ahead at a speed of approximately $2\frac{1}{2}$ inches per minute.

The tape is pulled off the left hand feed reel in a clockwise direction. It passes under a guide post, located on the left side of the machine, and swings back over the magnetic recording heads. The tape is here curved in an arc, by the gate assembly, to follow the rotating heads of the magnetic recording wheel assembly. After passing through the gate assembly, the tape is fed between the 411 111 rubber pressure roller and the large knurled roller of the 411 066 drive roller and shaft assembly. It is this drive roller and shaft assembly which drives the tape, as mentioned previously. The tape finally passes

under a guide post, located on the right side of the machine, and is wound, in a clockwise direction, on the right hand take-up reel. This take-up reel is spring belt driven by the 411 062 pulley attached to the drive roller and shaft assembly. Since the pulley that is staked on the take-up reel shaft has the same diameter as the 411 062 pulley, the take-up reel operates to take up the slack tape at the same speed that the tape is being driven.

Provision has also been made in the design of the tape drive system so that the tape can be operated ahead at a faster than normal rate (playback scanning), or be operated backwards (a repeat listening operation). This feature has been made possible by designing the 411 062 pulley, which is **securely** fastened to the shaft of the 411 066 drive roller and shaft assembly, so that it is not directly geared to the drive system, but only connected to the 411 061 drive system gear through a spring and roller dog arrangement. Thus, the 411 066 drive roller and shaft assembly, whose large knurled roller is the driving force for the tape, is able to be rotated clockwise or counterclockwise because the 411 062 pulley can be slipped on the teeth of the 411 061 gear. The 411 061 gear has additionally been designed so that the detents which the roller dog follow (the teeth of the 411 061 gear) are spaced so that the machine does not have to be retuned when the tape is driven ahead or backward by the drive roller and shaft assembly.

When the drive roller and shaft assembly is rotated clockwise (playback scanning), the tape is driven forward through the gate assembly and onto the take-up reel. Since the take-up reel shaft and drive roller and shaft assembly are linked together by a spring belt, the tape is automatically taken-up as fast as it is driven forward. When the drive roller and shaft assembly is rotated counterclockwise (a repeat listening operation), the tape is driven backward through the gate assembly and back on the feed reel. There is now, however, no provision for automatically taking up the resulting slack tape, and, therefore, the slack tape must be manually taken up by turning the feed reel counterclockwise with the left hand at the same time that the drive roller and shaft assembly is being rotated counterclockwise with the right hand. If this is not done, the tape will crinkle up to the left of the 411 111 rubber pressure roller and may be damaged.

Due to the fact that the magnetic heads record transverse across the tape surface, whenever the tape is played back, it is usually necessary to align the recorded tracks on the tape with the magnetic heads. A tuning lever is provided for this operation. This tuning lever is attached to a tuning lever shaft assembly, which contains a collar with a pin fastened off-set on its opposite end. This pin fits into a slot in the tuning lever assembly. When the tuning lever is rotated, the complete tuning lever assembly is moved up or down, depending upon the direction in which the tuning lever is rotated. The up or down movement of the tuning lever assembly causes the 411 085 intermediate gear, which is fastened to the tuning lever assembly, to move up or down and thus rotate slightly clockwise or counterclockwise. Since this intermediate gear is meshed with the 411 061 gear, it imparts this slight movement to the 411 061 gear which in turn rotates the drive roller and shaft assembly and thus moves the tape ahead or back a slight amount to line up the recorded track with the magnetic heads.

SECTION VI

MODEL S124 TAPE RECORDER WITH INBUILT - V.A.R.

The part Number 411 005 Model S-124 TAPE RECORDER contains a built-in voice actuated relay that will start the recorder motor when a signal is received and will stop the motor when the signal ceases. It can be used to make satisfactory recordings with microphone, telephone or communications line (when used for telephone recording with beep box, some provision must be made to stop the beep tone when the telephone circuit is broken so that the tone will not keep the voice relay in the recorder closed when the telephone is not in use). For installation and operating instructions refer to Operating Instructions booklet, Part Number 411 232.

To operate the Recorder with VAR, proceed as follows:

1. With "REC-STOP-PLAY" selector switch in STOP position, turn "OFF-VOL" control clockwise to turn power On. Power indicator lamp will light. Allow 30 seconds to warm up.
2. With "AUTO-MAN" switch (located on rear panel) in MAN position turn "REC-STOP-PLAY" switch to REC position (which starts tape recorder motor). Observe visual "VOL, INDICATOR" and adjust "OFF-VOL" control to obtain flash of lamp when recording the weakest signal desired.
3. Turn the "REC-STOP-PLAY" switch to STOP position.
4. Turn the "TIME DELAY" control (located on top of chassis next to the oscillator control) to approximately CENTER OF ADJUSTMENT.
5. Place "AUTO-MAN" switch in AUTO position.
6. Place "REC-STOP-PLAY" switch in REC position and adjust the "SENS" (sensitivity) control (located on top of chassis next to the "TIME DELAY" control) until the weakest signal starts the recorder. (Counterclockwise to increase sensitivity, clockwise to decrease sensitivity). Do not turn too far counterclockwise, otherwise extraneous noise or signal will start the recorder.
7. Readjust the "TIME-DELAY" control so that the relay will not stop the recorder during normal pauses in speech. The "TIME-DELAY" is at minimum (0-seconds) when turned fully clockwise and at maximum (15 seconds) when turned fully counterclockwise.

SECTION VII

MODEL BE-24

DEMAGNETIZER

Type ST-124 reels of magnetic tape can be bulk erased in approximately 5-10 seconds with Model BE-24 Demagnetizer. This Demagnetizer, shown in Figure 9 on preceeding page, is designed to be used on a 105-125 volt, 60 cycle source. Equipment draws approximately 5 amperes. Because of high voltage generated by Demagnetizer circuit, a special grounding point (A) has been provided. NEVER use equipment without grounding this point, the Demagnetizer has a momentary ON-OFF Switch that automatically returns to the OFF position. This is necessary for INTERMITTENT operation. The Demagnetizer should not be kept on continuously as it may be damaged. A Neon Lamp glows when the ON-OFF Switch is held in the ON position, indicating the Demagnetizer is functioning.

NOTE: Should this Lamp stay on, indications are that the ON-OFF Switch is shorted. Power Cord should be immediately disconnected from source and Switch replaced.

The core of the magnetic pole pieces has two coils. These coils are connected in series with a capacitor across the incoming power line to provide a series resonant circuit. The magnetic field set up by the coils in this series resonant circuit is used to demagnetize the reel of recorded magnetic tape. Resonance is important in erasure process. Should replacement of the coils be necessary, connect exactly as one being removed.

Refer to Fig. 9, on following page SCHEMATIC DIAGRAM DEMAGNETIZER.

Higher voltages (to coils) can be attained when connected to taps as illustrated on schematic.

To erase a full reel of tape, switch Demagnetizer ON with left hand (lamp on Demagnetizer must light), place reel of tape between poles of Demagnetizer with right hand, and slowly rotate reel of tape until three complete revolutions have been made. Make sure tape is a few feet away from the Demagnetizer poles before releasing "ON-OFF" Switch, tape will be completely erased and ready for use.

CAUTION

AC magnetic field created by two poles of Demagnetizer is VERY STRONG. Be careful not to place any delicate instrument (such as a watch) close to this field.

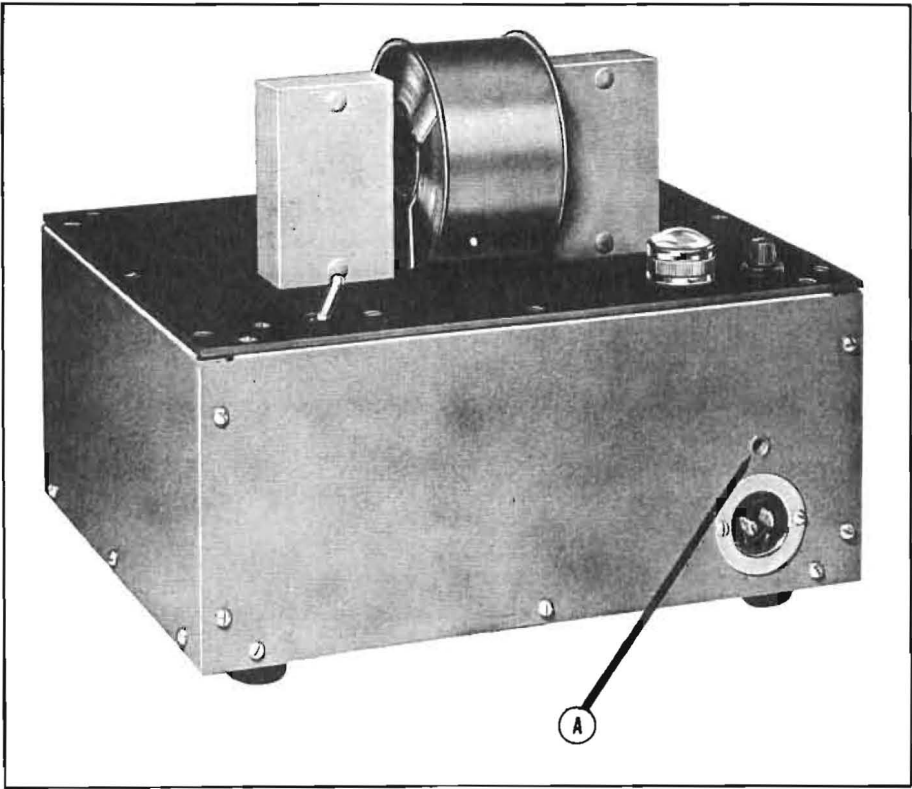
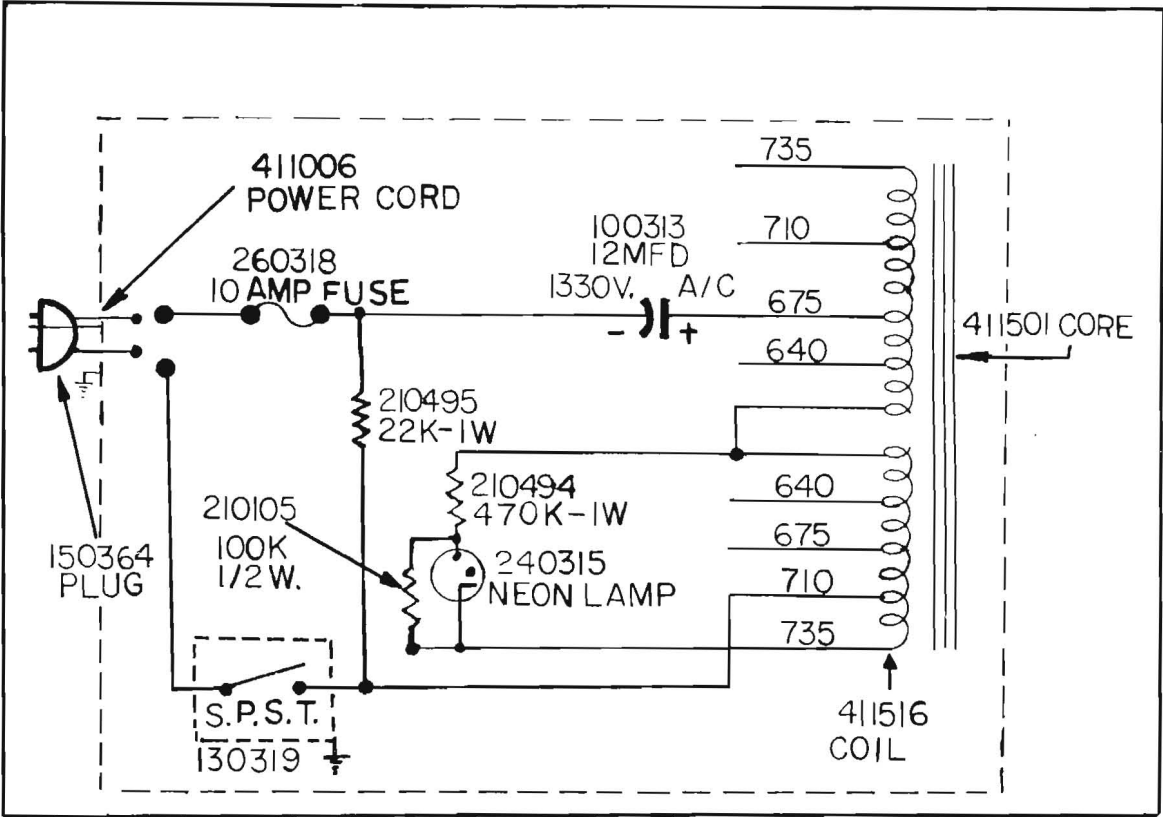


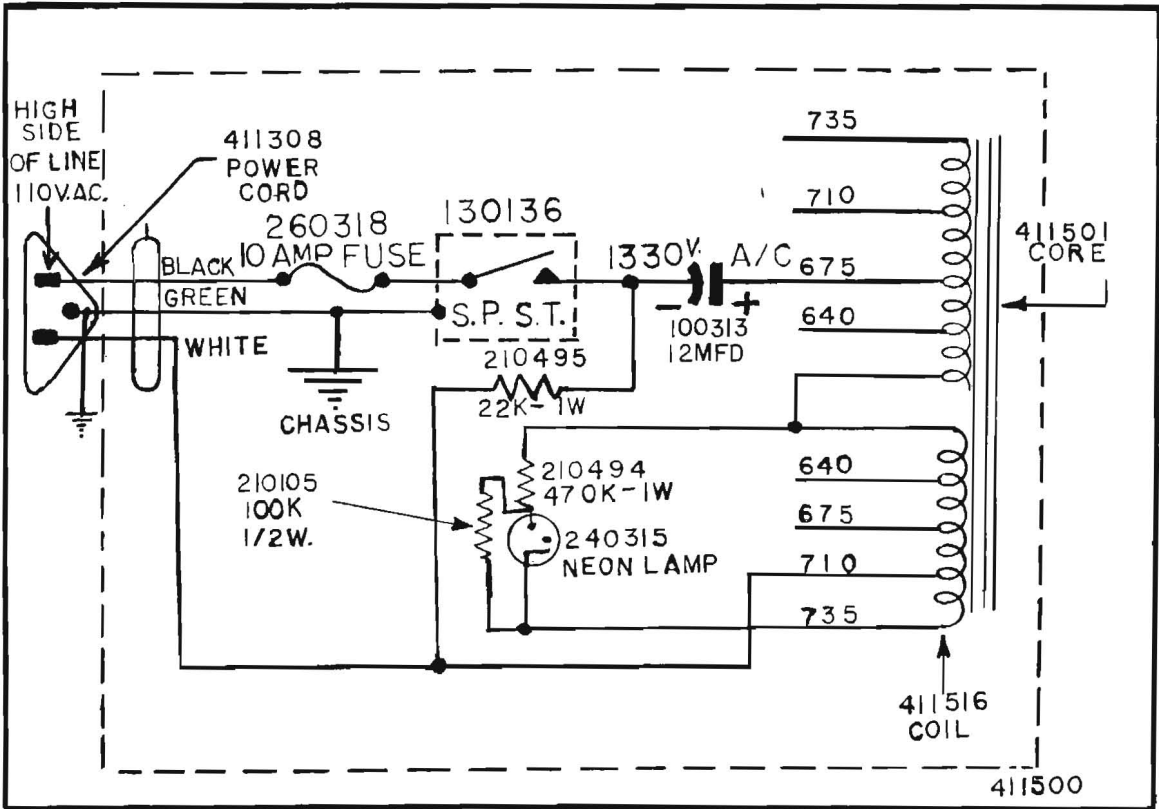
FIG. 9. Demagnetizer

FIG. 10. Schematic Diagram Demagnetizer



This schematic diagram is for machines below
Serial Number 435600

FIG. 10. Schematic Diagram Demagnetizer



This schematic diagram is for machines above
Serial Number 435600

SECTION VIII

TOOLS

Outlined below are two lists of tools, the first of which are SPECIAL TOOLS, obtainable from the factory, and the second of which are tools only obtainable locally. All of these tools are required to properly service the Model S-124 Tape Recorder-Reproducer.

SPECIAL TOOLS

Part Number	Description
091 128.....	Wrench, Allen #8, W/Handle.
180 541.....	VISI-MAG, One Pint Can.
180 572.....	Oil, Socony Vacuum Grade DTE, 1 Ounce Bottle.
180 573.....	Grease, Beacon #325, Esso Standard Oil, 8 Ounce Can.
400 374.....	Screw Holding Driver, For #6, #8, #10, and 1/4 Inch Screws.
411 520.....	Gage, Shim, .005 Inches.
411 523.....	Tape, Polishing, 40" Strip.

ADDITIONAL TOOLS

- White Petroleum Jelly (Vaseline), Jar
 - Mirror (Approx 4" X 2")
 - Meter, VTVM (Range to 35,000 Cycles)
 - Pliers, Long Nose
 - Resistor, 100 ohms, 1% Precision
 - Screwdriver, Small (Jewelers)
 - Screwdriver, 5/32" Blade Width
 - Screwdriver, 1/4" Blade Width
 - Signal Generator, 1000 Cycle (or Variable)
 - Wrench, Allen #8, 90 Degree Type. Also #4 Allen Wrench.
 - Microphone, 50 Ohm Impedance, Electro-Voice Model 630
(or Turner Model U9S).
-

SECTION IX

RECOMMENDED PARTS

STOCK

To service and repair the Model S-124 Tape Recorder-Reproducer, a stock of the essential parts of the machine should be carried. The list outlined below consists of all the parts mentioned in this manual as possible replacement items, plus some additional parts that might, in the opinion of the Factory Service Department, require replacement.

090 047	Nut, Hex, 6-32.....	Pkg. of 30
090 048	Washer, Lock, #6.....	Pkg. of 30
090 069	Washer, Flat, #6.....	Pkg. of 30
091 133	Screw, Allen Set, 8-32 x 3/16.....	Pkg. of 10
100 141	Capacitor, .001 Mfd, 600 VDC, Disc....	Pkg. of 2
100 233	Capacitor, .25 Mfd., 400 VDC, Tubular.	Pkg. of 2
100 236	Capacitor, .0008 Mfd., 600 VDC, Disc..	Pkg. of 2
120 126	Ring, Retaining, "E" 5133-18.....	Pkg. of 20
120 144	Ring, Retaining, "E" 5133-9.....	Pkg. of 20
120 161	Ring, Retaining, "E" 5133-62.....	Pkg. of 20
210 105	Resistor, 100,000 Ohms, $\frac{1}{2}$ W.....	2
210 133	Resistor, 33 Ohms, $\frac{1}{2}$ W.....	2
210 138	Resistor, 1,000 ohms, $\frac{1}{2}$ W.....	2
210 449	Resistor, 2,500 Ohms, 20W.....	2
210 226	Resistor, 250 Ohms, 5W.....	2
210 484	Resistor, 15 Ohms, $\frac{1}{2}$ W.....	2
220 127	Screw, 6-32x1 $\frac{1}{2}$, Rd. hd.....	Pkg. of 30
220 227	Screw, 6-32x2 $\frac{1}{4}$, Rd. Hd.....	5
240 123	Tube, Vacuum, 12AT7.....	3
240 144	Tube, Vacuum, 6AQ5.....	1
240 145	Tube, Vacuum, 6X4.....	1
240 313	Lamp, Neon Type NE-51, 105-125V.....	Pkg. of 10
240 319	Lamp, #1815, 12 Volts, 0.20 Amps.....	Pkg. of 10
250 140	Washer, Insul., 3/16 I.D.x.405 O.D....	Pkg. of 30
250 352	Washer, Flat, .183 I.D. x 3/8 O.D.....	Pkg. of 20
250 356	Washer, Flat, 252 I.D. x $\frac{1}{2}$ O.D.....	Pkg. of 20
260 160	Tube Retainer.....	4
260 235	Knob, Long, With #8 Allen Set Screw...	2
260 236	Knob, Round, With #8 Allen Set Screw..	1
260 237	Ball, 5/32" Diameter (Drive Shaft)....	Pkg. of 5
260 238	Contacts, Brush & Lead Assembly.....	Pkg. of 10
411 011	Coupling, Flexible, 30 RPM Drive Gear.	1
411 012	Coupling, Flexible, Worm Drive Shaft..	2
411 054	Disc, Thrust, Nylon (Thrust Screw)....	Pkg. of 10
411 063	Dog, Roller, Spur Gear.....	Pkg. of 5
411 093	Magnetic Recording Wheel Assembly.....	1
411 111	Roller Assembly, Pressure, Rubber.....	2
411 146	Gate Assembly.....	1
411 197	Gear, Drive, 30 RPM.....	1
411 200	Spring, Ramp Assembly.....	Pkg. of 10
411 524	Shaft, Drive, Worm (W/ 260 237 Ball)..	1

Stock
these

Section IX. Recommended Parts Stock

SECTION X LUBRICATION AND MAINTENANCE INSTRUCTIONS

In order to insure reliable and long operating life for the Model S-124 Tape Recorder-Reproducer, the lubrication and maintenance instructions outlined in this section should be carefully followed. The instructions are designed specifically for a machine used 24 hours a day.

Under continual operation, maintenance must be performed on the Model S-124 Tape Recorder-Reproducer twice a year. A minimum maintenance check can be performed at the 6th month period, which will insure continued reliable performance. This 6th month check can be performed at the machine location.

The second maintenance check, performed at the 12th month period, can best be done back at the Service Shop, as this particular check is more involved than the 6th month check. A loan machine should be left with the customer.

If a maintenance plan which alternates the 6th and 12th month checks outlined in this section is carefully followed, the Model S-124 Tape Recorder-Reproducer will perform reliably for many years. The lubricating oil and grease mentioned in these instructions can be obtained in small quantities from the Soundsciber Corporation. Refer to Section VII, Tools, for the part numbers of the Socony Vacuum DTE oil and Esso Standard Oil Co. Beacon #325 Grease.

6th MONTH MAINTENANCE CHECK

- (a) Remove mechanical and electrical chassis assembly from cabinet. Remove 411 239 flywheel guard (refer to Section XI, Paragraph 4).
- (b) Replace 6X4 rectifier tube and 6AQ5 power output tube. Check all three 12AT7 tubes and replace any which are questionable.
- (c) Check 411 111 rubber pressure roller to make sure that it is not excessively worn, that it is spring loaded against large knurled roller of 411 066 drive roller and shaft assembly when LOAD-RUN lever is in RUN position, and that it is free of oil and grease.
- (d) Refer to Section XI, Paragraph 3, for disassembly and reassembly instructions involved in performing following operations.
 - (1) Replace 411 093 magnetic recording wheel assembly. ✓
 - (2) Clean and lightly lubricate outboard oilite bearing in 411 037 mounting and bearing assembly. Also, lightly lubricate outboard oilite bearing in 411 083 outboard bearing assembly. Lubricate both bearings with Socony "DTE" oil.
- (e) After magnetic recording wheel assembly has been changed, lightly lubricate, with white petroleum jelly, teeth of 411 024 spur gear, 411 085 intermediate spur gear, and 411 061 gear.
- (f) Place equipment up on end, turn equipment ON, and operate motor. Lubricate both sides of oilite bearing in 411 073

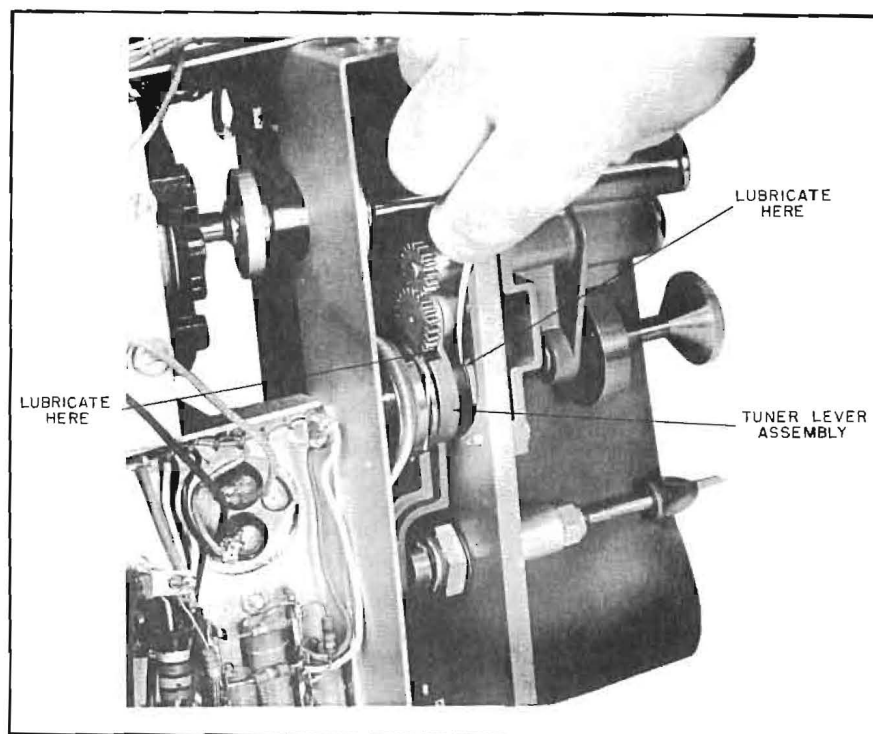


FIG. 11. Oiling Bearing In 411073 Tuner Lever Assembly

tuner lever assembly (where 411 066 drive roller and shaft assembly goes through and where 411 061 gear rides) with Socony "DTE" oil (see Figure 11 on preceding page.)

- (g) Adjust bias current to give .006 amps through magnetic heads during RECORD. Follow BIAS CURRENT ADJUSTMENT instructions given in Section XII, Paragraph 5.
- (h) Check to make sure magnetic heads are centered in slots in shoes of gate assembly, that 411 162 elevator arm finger is acting as stop on gate assembly, and that there is a small space between flat washer and retaining ring on shafts of shoes of gate assembly when machine is loaded with tape and is in RUN position (refer to Section XII, Paragraph 6). Make a voice recording (using an Electro-Voice Model 630 or Turner Model U9S microphone) and check for negligible wow and flutter, and good quality.

12th MONTH MAINTENANCE CHECK

- (a) Remove mechanical and electrical chassis assembly from cabinet. Remove 411 239 flywheel guard (refer to Section XI, Paragraph 4).
- (b) Replace all tubes, incandescent power indicator lamp, and neon recording volume indicator lamp.
- (c) REPLACE 411 111 rubber pressure roller (refer to Section XI, Paragraph 1.)
- (d) Refer to Section XI, Paragraph 6, for disassembly and reassembly instructions involved in making checks described as follows:
 - (1) Replace 411 093 magnetic recording wheel assembly.
 - (2) Check 411 011 drive gear flexible coupling, and change if torn or damaged.
 - (3) Remove 411 524 worm drive shaft, 411 197 30 RPM drive gear, and 411 183 gear and shaft assembly from gear box. Clean out gear box and oilite bearings in gear box. Lightly lubricate oilite bearings with Socony "DTE" oil.
 - (4) Clean and lightly lubricate oilite bearings in 411 037

mounting and bearing assembly and 411 083 outboard bearing assembly with Socony "DTE" Oil.

- (5) Clean and relubricate 411 524 worm drive shaft, 411 197 30 RPM drive gear, and 411 183 gear and shaft assembly. Lightly cover teeth only of gears and threads with a thin film of Beacon 325 grease. Replace any of above three components if their teeth show excessive wear.
- (6) Change brush tip contacts, part number 260 238, of brush assembly. Check contacts to make sure they have proper loading on slip rings of magnetic recording wheel assembly when machine is reassembled, and that they are not rubbing against either of two screws fastening slip ring assembly to magnetic recording wheel assembly (see Section XII Paragraph 1).
- (e) Reassemble machine. Run it for a while after reassembly. Pay particular attention to part of shaft of 411 197 30 RPM drive gear that extends a bit outside gear box (next to 411 066 drive roller and shaft assembly.) If any excess grease oozes out here, it will get on large knurled roller of drive roller and shaft assembly, 411 111 rubber pressure roller, and on tape.
- (f) Lightly lubricate, with white petroleum jelly, teeth of 411 024 spur gear, 411 085 intermediate spur gear, and 411 061 gear.
- (g) Place equipment up on end, turn equipment ON, and operate motor. Lubricate both sides of oilite bearing in 411 073 tuner lever assembly (where 411 066 drive roller and shaft assembly goes through and where 411 061 gear rides) with Socony "DTE" oil.
- (h) Remove and check 411 052 thrust screw to see that it has a 411 054 nylon disc (approximately $\frac{1}{2}$ inches in diameter) and check to see that the 411 054 nylon disc is not badly worn.
- (i) Check for proper alignment and thrust adjustment of 411 075 motor, 411 008 intermediate shaft, and 411 524 worm drive shaft, as described in Section XII, Paragraph 2.
- (j) Check to make sure screws holding ramp assembly, motor, elevator arm finger, and front panel knobs are tight. Also, replace any screws that have burred heads.
- (k) Adjust bias current to give .006 amps through magnetic heads during RECORD. Follow BIAS CURRENT ADJUSTMENT instructions given in Section XII, Paragraph 5.
- (l) Set up gate assembly, as outlined in Section XII, Paragraph 6, and make a voice recording on machine. Check for good playback quality and negligible wow and flutter.

SECTION XI DISASSEMBLY AND REPLACEMENT INSTRUCTIONS

With the instructions outlined in this section, any of the MAJOR PARTS of the Model S-124 Tape Recorder-Reproducer can easily be re-placed. The 411 227 top and 411 228 bottom cover assemblies, in most cases, must be removed before any of the replacement instructions are begun. Also, whenever working on the machine, always remember to place a strip of magnetic tape between the gate assembly and the 411 093 magnetic recording wheel assembly, to protect the magnetic heads from being damaged.

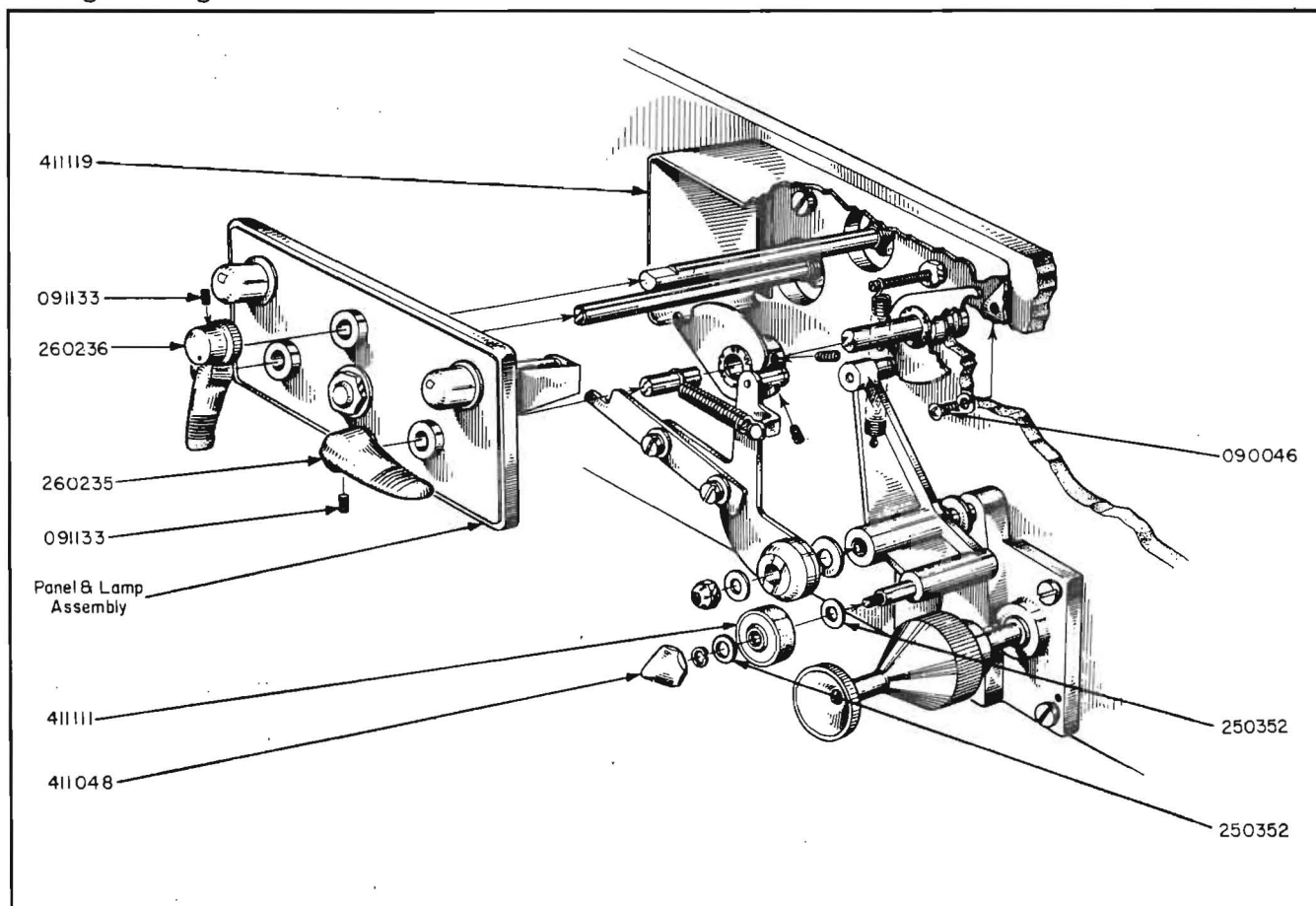


FIG. 12. Center Front Mechanical Assembly

1. 411111 Rubber Pressure Roller (Figure 12).

- (a) Remove 411 048 crown nut with $\frac{1}{2}$ " Spintite wrench. Remove 411 111 rubber pressure roller. Do not lose 250 352 thrust

washers, that go on either side of rubber pressure roller, or lockwasher.

(b) Reassemble new 411 111 rubber pressure roller.

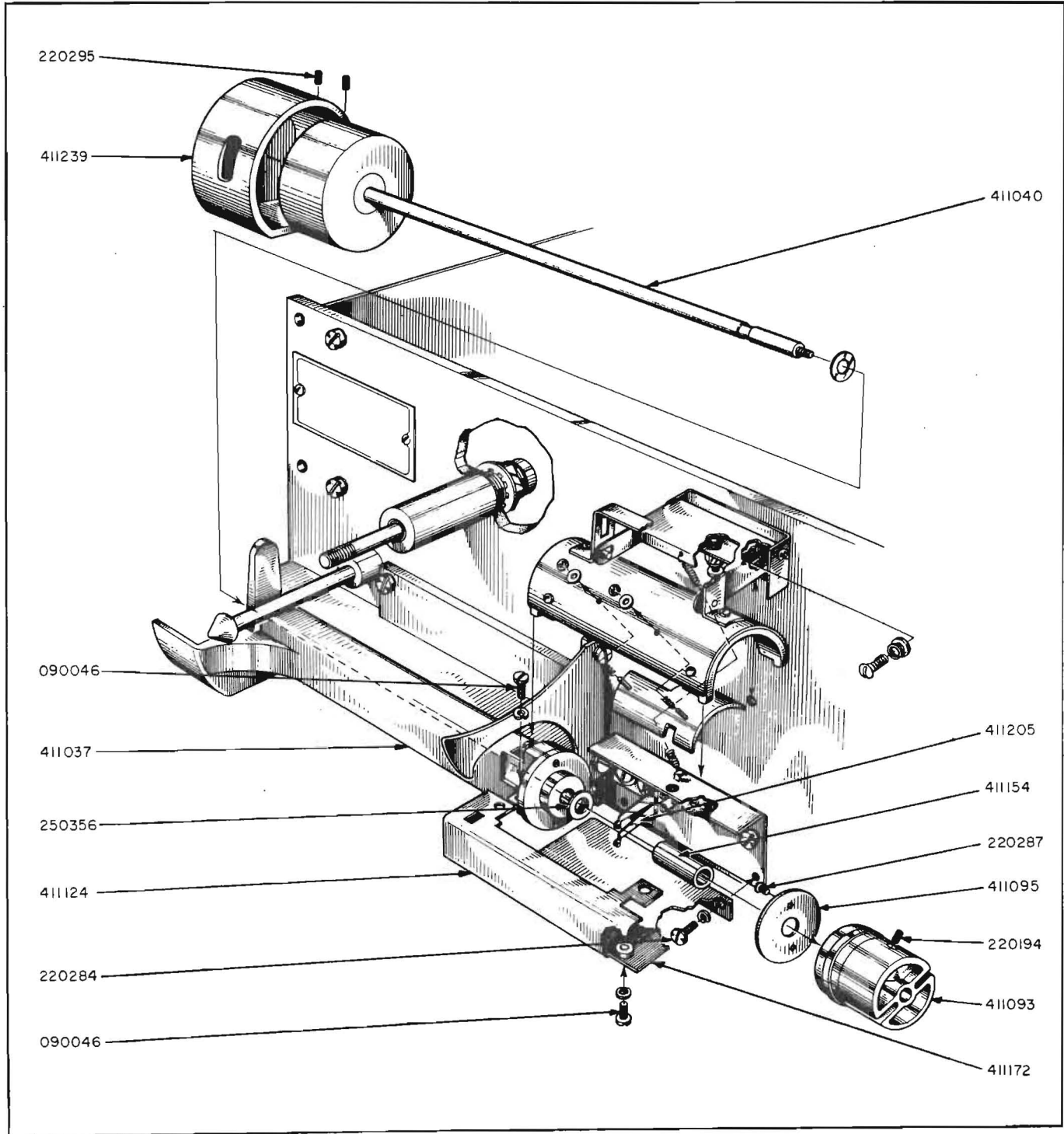


FIG. 13. Left Front Mechanical Assembly

2. Panel and Lamp Assembly and 411119 Front Panel Casing (Figure 12).

(a) Remove two 260 235 long control knobs and one 260 236 round control knob, by loosening their 091 133 #8 allen set screws, and pull out and swing aside panel and lamp assembly.

- (b) Remove six 090 046 screws, fastening 411 119 front panel casing to front panel, and remove 411 119 front panel casing. Use 400 374 screw holding driver (one of special tools) to remove and replace these screws.
- (c) Reassemble in same manner as disassembly, making sure to dress leads going to panel and lamp assembly away from cams on control shaft, and making sure LOAD-RUN knob is put back in proper position. Early model machines did not contain spaghetti coverings over lugs of lamp sockets where leads are soldered. A short of one of these lugs to case can blow fuse or even cause a more serious accident. Tape up these lugs, with electrical tape, if they are bare.

3. 411093 Magnetic Recording Wheel Assembly and 411011 Drive Gear Flexible Coupling (Figures 13, 14).

The 411 093 magnetic recording wheel assembly should be replaced at least once every six months, if the machine is operated continuously over this period. This represents over 2000 hours that each magnetic head has been in contact with the tape surface, and by this time the projection of the two heads above the tape guide ring on the magnetic wheel assembly will be practically worn off. THE INDIVIDUAL MAGNETIC HEADS CANNOT BE REPLACED IN THE FIELD. Follow instructions a-f and o-u, outlined below, when replacing the 411 093 magnetic recording wheel assembly.

Whenever the 411 011 drive gear flexible coupling requires replacement, follow instructions a-f and the asterisk instructions g-n outlined below.

- (a) Place LOAD-RUN lever in LOAD position and remove any tape that may be on machine.
- (b) Loosen two 220 295 slotted head screws and slip off 411 239 flywheel guard.
- (c) Unscrew two 220 284 screws and two 090 046 screws and remove 411 172 bottom shield.
- (d) Hold 411 011 drive gear flexible coupling and turn 411 040 flywheel and shaft assembly toward you, enough to break coupling connection.
- (e) Loosen 220 194 #8 allen set screw holding 411 093 magnetic recording wheel assembly to shaft of flywheel and shaft assembly. Completely unscrew flywheel and shaft assembly from flexible coupling.
- (f) Pull flywheel and shaft assembly out enough to remove 411 093 magnetic recording wheel assembly. Handle magnetic recording wheel assembly CAREFULLY, being especially careful not to mar finely polished surfaces of magnetic heads.
- * (g) Unscrew two 090 046 screws and remove 411 124 front tape guide.

Section XI. Disassembly and Replacement Instructions

- *(h) Break 411 011 drive gear flexible coupling connection to 411 197 30 RPM drive gear by turning flexible coupling toward you.

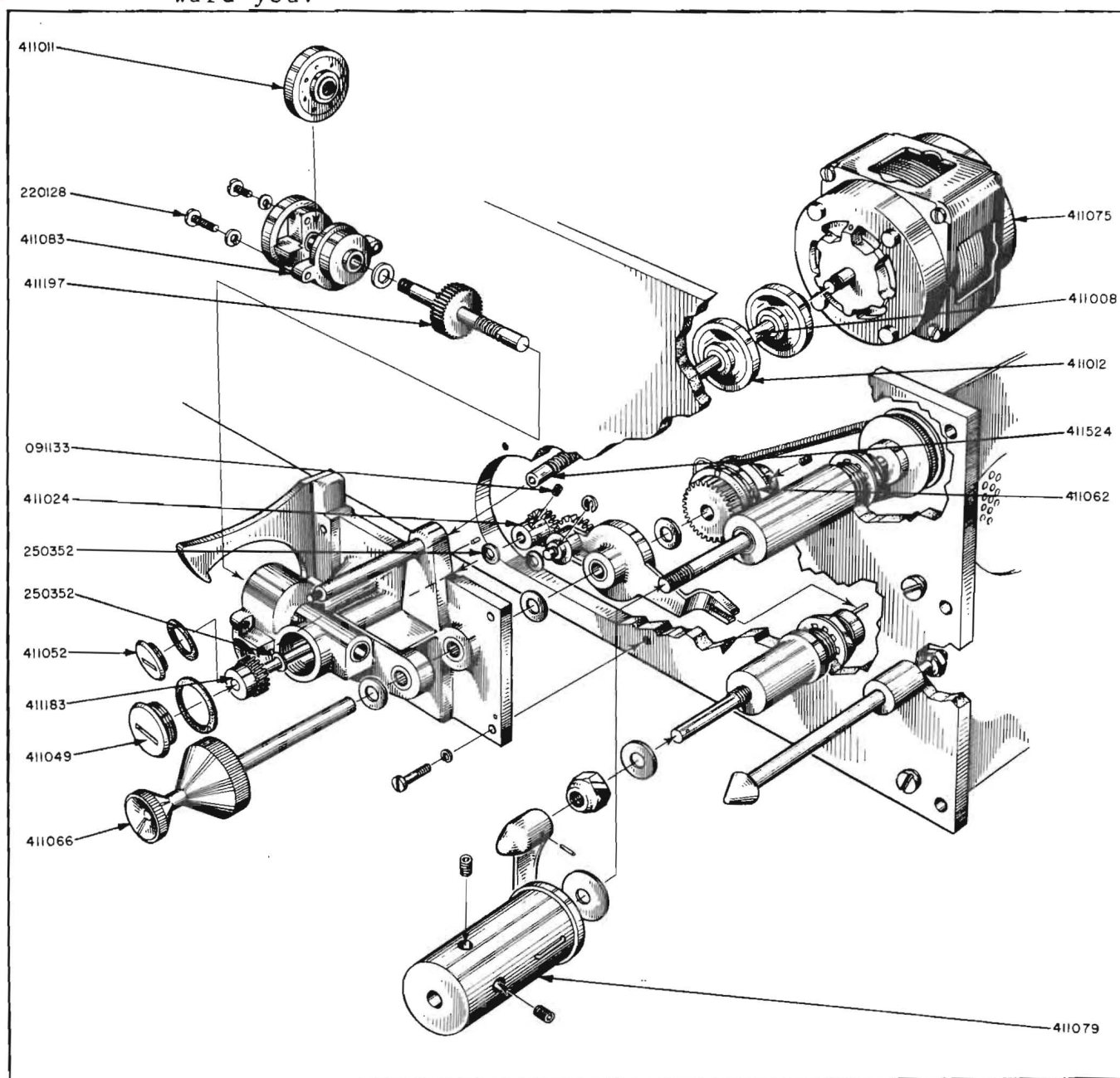


FIG. 14. Right Front Mechanical Assembly

- *(i) Remove two 220 128 screws holding 411 083 outboard bearing assembly to gear box. Completely unscrew flexible coupling from 411 197 30 RPM drive gear (pull outboard bearing out at same time). It will be necessary to remove outboard bearing to remove 411 011 drive gear flexible coupling.
- *(j) Reassemble new flexible coupling and outboard bearing assembly in place.
- *(k) Snug tighten two 220 128 screws holding outboard bearing assembly to gear box. Slip magnetic recording wheel assembly back on flywheel shaft, and run threads on end of flywheel shaft almost completely into 411 011 drive gear flexible coupling.

- * (l) Now, check for bind in movement of flywheel shaft by rotating (and sliding) flywheel and shaft assembly back and forth. Any bind requires resetting position of 411 083 outboard bearing assembly. Fasten 220 128 screws, holding outboard bearing assembly, firmly in place when outboard bearing is properly positioned. Recheck for bind.
- * (m) Reassemble 411 124 front tape guide.
- * (n) Follow steps p-u described below to reassemble machine.
- (o) Reassemble new magnetic recording wheel assembly on flywheel shaft, and run threads on end of flywheel shaft completely into 411 011 drive gear flexible coupling.
- (p) Place 411 520 shim gage (one of special tools) between flywheel and outboard bearing of 411 037 mounting and bearing assembly, push flywheel and shaft assembly firmly toward right, push magnetic recording wheel assembly to left, firmly against 411 154 fiber spacer, and fasten magnetic recording wheel assembly to flywheel shaft (see Figure 16 in Section XII. Paragraph 4).
- (q) Remove 411 520 shim gage.
- (r) Reassemble 411 172 bottom shield.
- (s) Reassemble 411 239 flywheel guard. Refer to Section XIII. Paragraph 1.
- (t) Check and adjust bias current as described in Section XII. Paragraph 5.
- (u) Make sure gate assembly is set up properly, as described in Section XII. Paragraph 6, and make a few test recordings with either a Turner Model U9S (set on 50 ohm range) or an Electro-Voice Model 630 microphone.

4. Mechanical and Electrical Chassis Assembly (Figure 15).

- (a) Remove three 220 290 screws and 090 180 lock washers fastening right side of front panel to cabinet bracket.
- (b) Remove two 220 290 screws and 090 180 lock washers fastening left side of front panel to cabinet bracket.
- (c) Remove two 090 183 rear catch screws.
- (d) Pull mechanical and electrical chassis assembly free from 411 226 cabinet assembly.

5. 411075 Motor and 411012 Worm Drive Shaft Flexible Couplings (Figure 14).

When replacing the motor of the Model S-124 Tape Recorder, follow instructions a and g-n outlined on the following page.

When replacing either or both of the 411 012 worm drive shaft flexible couplings, follow instruction a and the asterisk instructions b-f outlined on the following page.

Section XI. Disassembly and Replacement Instructions

- (a) Remove mechanical and electrical chassis assembly, as described in Paragraph 4, this section.
- *(b) Turn mechanical and electrical chassis assembly over, hold shaft of motor with long nose pliers, and turn 411 012 worm drive shaft flexible coupling nearest motor to break coupling connection.

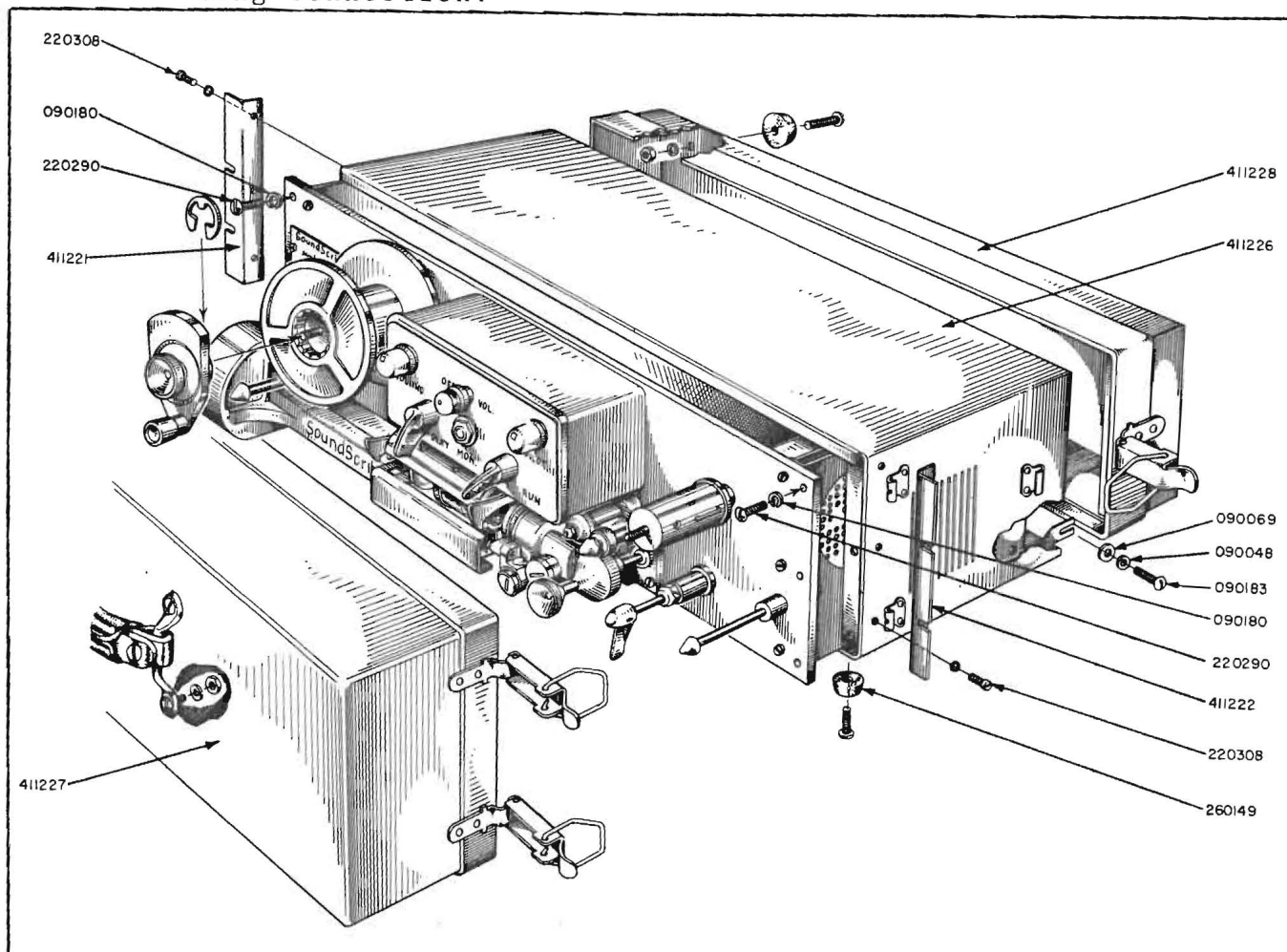


FIG. 15. Complete Machine And Cabinet Assembly

- *(c) Scribe marks on motor mounting bracket where motor screws are located, loosen 220 289 screws holding motor to motor mounting bracket, push motor back, and unthread and remove 411 012 worm drive shaft flexible coupling from motor drive shaft.
- *(d) Hold 411 008 intermediate shaft with long nose pliers and turn outer worm drive shaft flexible coupling to break connection. Unscrew coupling. Remove inner coupling in similar manner.
- *(e) Fasten new 411 012 coupling or couplings in same manner as they were removed.
- *(f) Follow steps 1-n, described on following page, to reassemble machine.
- (g) Unsolder brown motor lead from terminal 5 of deck A of 130 130 selector switch.

- (h) Turn amplifier chassis assembly over and unsolder red and black motor leads from 100 201 motor capacitor.
- (i) With amplifier chassis assembly in this position, hold shaft of motor with long nose pliers, and turn 411 012 worm drive shaft flexible coupling nearest motor to break coupling connection.
- (j) Scribe marks on motor mounting bracket, where motor screws are located, and remove four 220 289 screws holding motor to motor mounting bracket.
- (k) Unscrew coupling from motor, and remove 411 075 motor.
- (l) Fasten replacement motor back in position (with motor screws located at scribed marks), making sure 411 524 worm drive shaft, 411 008 intermediate shaft, and motor drive shaft are aligned approximately in a straight line. Screw worm drive shaft flexible coupling on motor. Resolder motor leads (brown lead to terminal 5 of Deck A of 130 130 selector switch, black lead to lug of 100 201 motor capacitor where green lead is attached, and red lead to empty lug of 100 201 motor capacitor).
- (m) Right amplifier chassis assembly and check for forward thrust of worm drive shaft by unscrewing 411 052 gear box thrust screw about $\frac{1}{2}$ a turn (with motor running). Couplings and worm drive shaft should move forward when this thrust screw is screwed out, and move back toward motor when thrust screw is screwed in. Position of motor will have to be changed if there is no thrust of worm drive shaft against gear box thrust screw. Keep shafts in alignment and do not forget to retighten thrust screw after this check has been made.

SPECIAL NOTE

Diaphragm material of both 411 012 worm drive shaft flexible couplings should not be ex-
cessively compressed when thrust adjustment
is made. Motor will have to be moved back if
diaphragm material is excessively compressed.

- (n) Reassemble mechanical and electrical chassis assembly to cabinet.

6. 411197 30 R.P.M. Drive Gear and 411524 Worm Drive Shaft (Figure 14)

DISASSEMBLY INSTRUCTIONS

- (a) Remove mechanical and electrical chassis assembly as described in Paragraph 4, this section.
- (b) Loosen two 220 295 screws and slip off 411 239 flywheel guard.
- (c) Remove two 220 284 screws and two 090 046 screws and remove 411 172 bottom shield.

Section XI. Disassembly and Replacement Instructions

- (d) Remove two 090 046 screws and remove 411 124 front tape guide.
- (e) Hold 411 011 drive gear flexible coupling and turn 411 040 flywheel and shaft assembly toward you, enough to break coupling connection.
- (f) Loosen 220 194 #8 allen set screw holding 411 093 magnetic recording wheel assembly to shaft of flywheel and shaft assembly. Unscrew flywheel and shaft assembly completely from flexible coupling.
- (g) Pull flywheel and shaft assembly completely out and remove 411 093 magnetic recording wheel assembly, 411 154 fiber spacer, and 250 356 thrust washer.
- (h) Unscrew and remove 411 049 screw plug assembly from gear box.
- (i) Turn mechanical and electrical chassis assembly up on end. Turn equipment ON and operate motor until 091 133 #8 allen set screws, fastening 411 024 spur gear to 411 183 gear and shaft assembly, come into position for loosening. Loosen set screws.
- (j) Remove 411 024 spur gear and then remove 411 183 gear and shaft assembly. Do not lose two 250 352 thrust washers.
- (k) Remove two 220 128 screws, fastening 411 083 outboard bearing assembly to gear box, and remove outboard bearing assembly (with 411 011 drive gear flexible coupling and 411 197 30 RPM drive gear attached).
- (l) Unscrew 411 011 coupling from drive gear and remove 411 197 30 RPM drive gear.
- (m) Remove 411 052 gear box thrust screw.
- (n) Break connection between 411 524 worm drive shaft and 411-012 front worm drive shaft flexible coupling, unscrew worm drive shaft from coupling, and pull out, through gear box, 411 524 worm drive shaft.

REPLACEMENT INSTRUCTIONS

- (o) Repeat reverse of Steps n, m and l.
- (p) Repeat reverse of Step k, but only snug tighten two 220 128 screws fastening 411 083 outboard bearing assembly to gear box.
- (q) Repeat reverse of Step j.
- (r) Repeat reverse of Step i, but place 411 520 shim gage (one of special tools) between gear box and 411 024 spur gear when fastening spur gear to 411 183 gear and shaft assembly.
- (s) Repeat reverse of Step h.
- (t) Repeat reverse of Step g, and in addition check for bind in

movement of flywheel shaft by rotating (and sliding) flywheel and shaft assembly back and forth. Any bind will require re-setting position of 411 083 outboard bearing. Fasten 220 128 screws, holding outboard bearing, firmly in place when outboard bearing is properly positioned. Recheck for bind.

- (u) Repeat reverse of Step f. To fasten 411 093 magnetic recording wheel assembly properly in place, insert 411 520 shim gage between flywheel and outboard bearing of 411 037 mounting and bearing assembly, push flywheel and shaft assembly firmly toward right, push magnetic recording wheel assembly toward left, firmly against 411 154 fiber spacer, and fasten magnetic recording wheel assembly to flywheel shaft with #8 allen set screw (See Figure 16 in Section XII.Paragraph 4).
- (v) Repeat reverse of Steps e-a.
- (w) Finally, check to see that 411 524 worm drive shaft is thrusting against 411 052 gear box thrust screw. This check is made with motor running. Make check by unscrewing gear box thrust screw about $\frac{1}{2}$ a turn. Couplings and worm drive shaft should move forward when this thrust screw is screwed out, and move back toward motor when thrust screw is screwed in. Position of motor will have to be changed if there is no thrust of worm drive shaft against gear box thrust screw. Also, make sure motor drive shaft, 411 008 intermediate shaft, and 411-524 worm drive shaft, are aligned approximately in a straight line.

SPECIAL NOTE

Diaphragm material of both 411 012 worm drive shaft flexible couplings should not be excessively compressed when thrust adjustment is made. Motor will have to be moved back if diaphragm material is excessively compressed.

SECTION XII

ADJUSTMENT INSTRUCTIONS

The Model S-124 Tape Recorder-Reproducer has been designed so that there are very few critical adjustments. The 411 079 mandrels (Figure 13. fastened to the take-up reel shaft and feed reel shaft, should have .005 inch "end play", as should the 411 040 flywheel and shaft assembly after the 411 093 magnetic recording wheel assembly has been fastened to it. This latter adjustment is described and illustrated in Figure 16 in Paragraph 4, this section. In addition, the 411 183 gear and shaft assembly and the 411 066 drive roller and shaft assembly should also have .005 inch "end play" when the 411 024 spur gear and 411 062 pulley respectively are fastened to them. All of these adjustments can be made with the 411 520 .005 inch shim gage, a special tool, to thus assure freedom of bind in these moving parts. The remaining adjustments, outlined below, should be carefully followed.

1. 411205 Brush And Lead Assembly.

The 411 205 brush and lead assembly is properly adjusted if the brush tip contacts are applying a loading on the slip rings of the 411 093 magnetic recording wheel assembly of no more than 1/16 of an inch and no less than 1/32 of an inch. Referring to Figure 12 the loading of the brush tip contacts can be checked by removing the 411 239 flywheel guard, the 411 172 bottom shield, loosening the set screw fastening the magnetic recording wheel assembly to the flywheel and shaft assembly, and then positioning the magnetic recording wheel assembly (with the flywheel and shaft assembly pushed firmly to the right) so that the slip rings just touch the contacts of the brush and lead assembly. The width of the space between the 411 154 fiber spacer (which should be pushed firmly to the left) and the printed slip ring assembly represents the loading of the brush tip contacts. A brush tip contact loading of more than 1/16 of an inch will result in excessive wear of both the brush tip contact and the slip ring. It may also cause wow. A brush tip contact loading of less than 1/32 of an inch may, in time, cause an intermittent or dead recording. Bend the brushes to obtain the proper loading.

After the above check has been made, refasten the 411 093 magnetic recording wheel assembly to the flywheel and shaft assembly as described in Paragraph 4, this section. Then, operate the motor of the machine and check to make sure the brush tip contacts do not rub against either of the two 220 287 screws, fastening the slip ring assembly to the magnetic recording wheel assembly. The position of the entire brush and lead assembly, or the position of the individual brushes, will have to be changed if either contact is rubbing against one of these screws. Replace the 411 172 bottom shield and 411 239 flywheel guard at completion of this adjustment.

2. Alignment And Thrust Adjustment of 411075 Motor, 411008 Intermediate Shaft, and 411524 Worm Drive Shaft.

Whenever any of the components mentioned above, or the 411 012 worm drive shaft flexible couplings are changed, the 411 075 motor may have to be repositioned so that its shaft, the 411 008 intermediate shaft, and the 411 524 worm drive shaft are aligned in approximately a straight line. Any excessive misalignment of these three components may introduce flutter into the recording and playback system. In addition, the machine should also be checked to see that the 411 524 worm drive shaft is thrusting against the 411 052 gear box thrust screw. This check is made by operating the motor and screwing out the 411 052 gear box thrust screw one-half a turn. Watch the flexible couplings during this test and make sure that they and the worm drive shaft move forward when the thrust screw is screwed out. Make sure, however, that, when the gear box thrust screw is tightened in place, there is no EXCESSIVE compressing of the diaphragm material of the flexible couplings. The motor should be moved forward or back on its mounting bracket (at the same time maintaining alignment as previously mentioned) to obtain the proper thrust adjustment.

3. 411118 Cam and Hub Assemblies (Figure 16).

To make any adjustments to the 411 118 cam and hub assemblies, it is necessary to first remove the three control knobs, pull the front panel and lamp assembly aside, and remove the 411 119 front panel casing. The proper adjustment of the two cams, as would be made if both cams were disassembled from the control shaft, is as follows:

- (a) Cam nearest front panel must be fastened to 411 170 control shaft assembly so there is .010 inches

"end play" in control shaft assembly, and so roller wheel of 411 521 pressure roller unit assembly fits into curved slot in cam (slot that is furthest distance from center hole in cam). 411 072 pressure roller spring should be in place during this adjustment. 411 111 rubber pressure roller will be lifted off large knurled roller of 411 066 roller and shaft assembly when cam is fastened in this position. Fasten cam

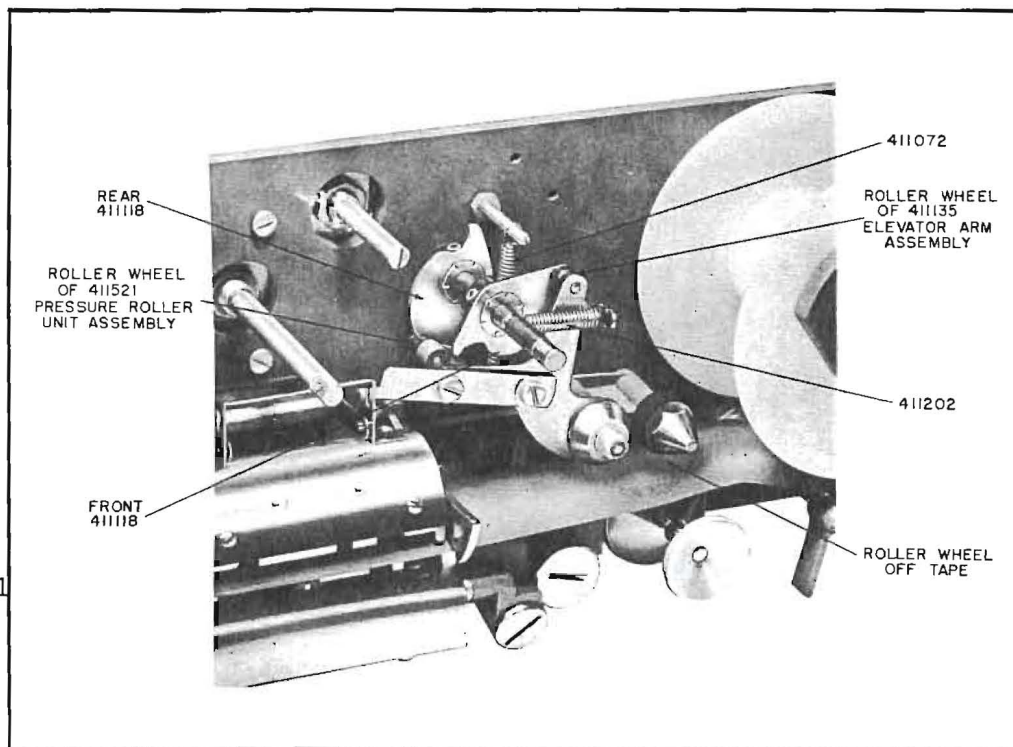


FIG. 16. 411118 Cam And Hub Assemblies

in place with two #8 allen set screws.

- (b) With 411 170 control shaft assembly in this same position, move front cam into position so roller wheel of 411 135 elevator arm assembly fits into curved slot in cam (slot that is furthest distance from center hole in cam). 411 202 elevator arm spring should be in place during this adjustment. Fasten cam in place with two #8 allen set screws. Now, refasten 411 119 front panel casing to front panel, put panel and lamp assembly back in place, and fasten control knobs tightly on shafts. With machine re-assembled, LOAD RUN knob should spring to RUN position when released from LOAD position, and 411 111 rubber pressure roller should be spring loaded against large knurled roller of 411 066 drive roller and shaft assembly.

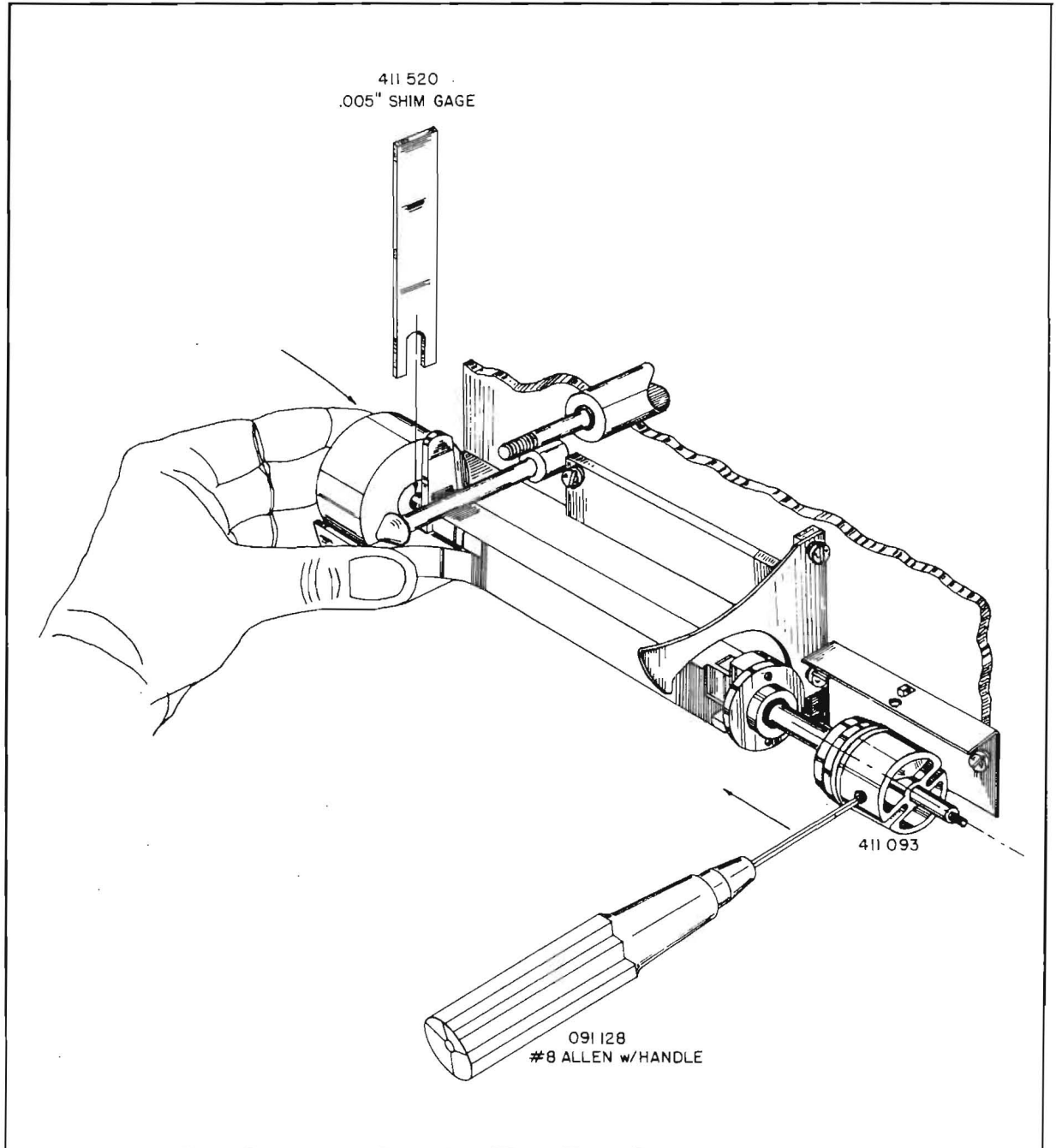


FIG. 17. 411093 Magnetic Recording Wheel Assembly Adjustment

4. 411093 Magnetic Recording Wheel Assembly (Figure 17).

The only adjustment made to the magnetic recording wheel assembly is to make sure it is firmly fastened to the shaft of the 411 040 flywheel and shaft assembly, allowing .005 inch "end play" in the shaft of this assembly (See Figure 16 on preceding page). After this adjustment has been made, check to make sure the 411 011 drive gear flexible coupling is not excessively compressed. If it is, add another 250 356 flat washer between the flywheel and the mounting and bearing assembly (there is one there already). The 411 011 coupling must not, however, rub against the outboard bearing of the 411.083 outboard bearing assembly. The flywheel guard and bottom shield must be removed to perform any adjustment in the positioning of the 411 093 magnetic recording wheel assembly on the shaft of the flywheel and shaft assembly. For illustration purposes, Figure 16 shows the 411 124 front tape guide also removed.

5. Bias Current Adjustment.

The bias current that flows through the magnetic heads during RECORD is factory set at 6 milliamps (.006 amps). This current is controlled

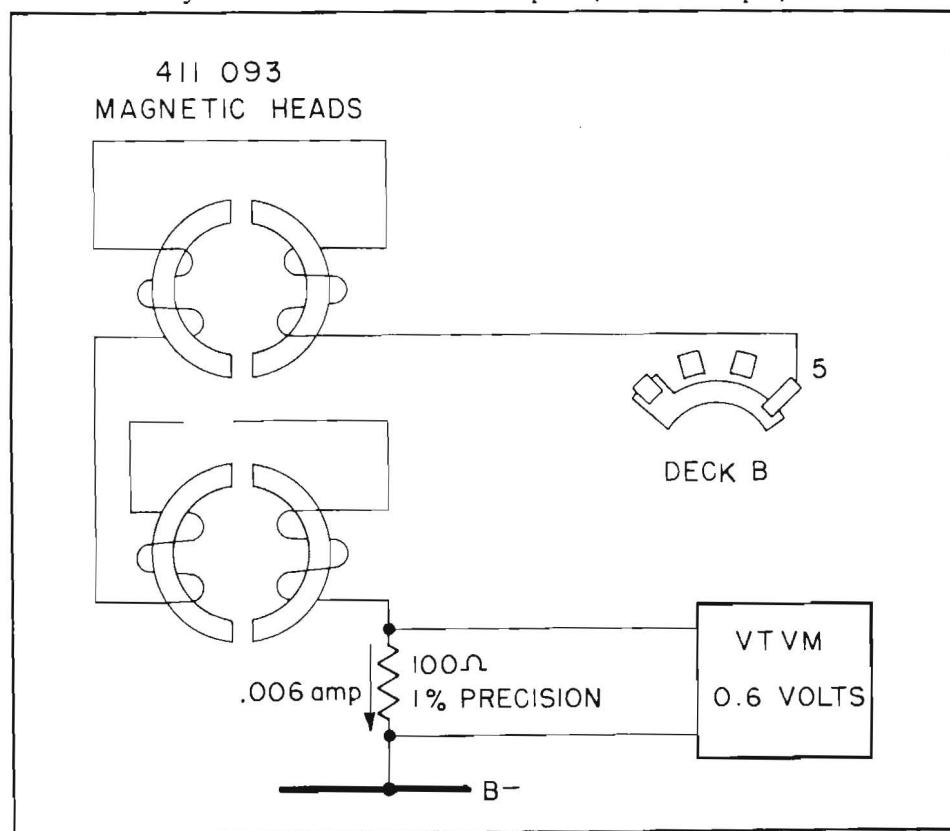


FIG. 18 Bias Current Adjustment

by a 210 492 30K potentiometer, located in the top upper amplifier chassis assembly. It is not absolutely necessary to check the bias current each time the 411 093 magnetic recording wheel assembly is changed. However, if the proper equipment is available, the short time required to check and, if necessary, reset the bias current will be rewarded by the knowledge that the machine is electrically adjusted to the point at which best RECORDING quality can be obtained. It will always be necessary to check the bias current when playback of a recorded signal

sounds weak and distorted.

To check or reset the bias current, a 100 ohm 1% precision resistor and an accurate VTVM (whose range extends to 30 Kilocycles) or a Model 300 Balantine meter, are needed. To check this current, unsolder the ground side of the magnetic heads (point X on the schematic diagram) and insert the 100 ohm 1% precision resistor here. Then, connect the VTVM across the 100 ohm resistor, remove all signals that may be connected to the machine, set the tape recorder selector switch in the RECORD position, set the tape recorder RECORD VOLUME control at zero, and adjust the 210 492 30K potentiometer to obtain 0.6 volts A.C. on

the VTVM (Figure 17). After the potentiometer has been set, be sure to remove the 100 ohm resistor and resolder the ground lead of the magnetic heads back in place.

6. 411146 Gate Assembly.

The gate assembly must be adjusted so that, when the tape recorder is loaded with tape, the gate assembly is down, and the machine is running (unless otherwise noted), the four conditions outlined below must be satisfied.

- (a) The gate assembly must be in position so that the magnetic heads are running approximately in the center of the slots in the 411 145 gate shoes (Figure 19).
- (b) The front edge of the gate assembly must be approximately parallel (when the machine is not running) with the top surface of the 411 124 front tape guide (Figure 20).
- (c) The vertical edge of the elevator arm finger must be acting as a stop for the gate assembly (Figure 21), and not the arm of the ramp assembly (Figure 19).
- (d) The shoes of the gate assembly must be resting properly on the tape surface so that a uniform head pattern is recorded on the tape.

To completely adjust a gate assembly to obtain the above conditions, the instructions outlined below must be carefully followed.

- (1) Remove 411 172 bottom shield.
- (2) Place blocks under right and left edges of machine, to lift machine up approximately 6" from working surface. Place a mirror, tilted toward you, beneath gate assembly.
- (3) With machine threaded with tape and with LOAD-RUN lever in RUN position, adjust 060 048 ramp lifting screw (Figure 19) to obtain a small space between 250 115 flat washer and 120 144 retaining ring on shafts of 411 145 shoe (Figure 20). Then, loosen two 220 284 ramp adjusting screws (Figure 19) until they are just snug tight.
- (4) Adjust left to right position of 411 160 ramp assembly to a) center magnetic heads of magnetic recording wheel assembly in slots in 411 145 shoes of gate assembly (Figure 19) andb) center ramp arms of ramp assembly between sides of 411 159 gate bridge assembly (Figure 21). Finally, adjust up and down position of 411 160 ramp assembly (without disturbing left to right adjustment just made) to level front edge of gate assembly so it is approximately parallel to top surface of 411 124 front tape guide (Figure 21). Now, carefully tighten two 220 284 ramp adjusting screws in place.

- (5) With LOAD-RUN lever still in RUN position, adjust 411 162 elevator arm finger (Figure 21) so that, without disturbing position of gate assembly, vertical edge of this finger just touches edge of right arm of 411 159 gate bridge assembly. Adjust horizontal edge of finger so it is approximately 1/16 of an inch below top of slot in 411 159 gate bridge assembly.

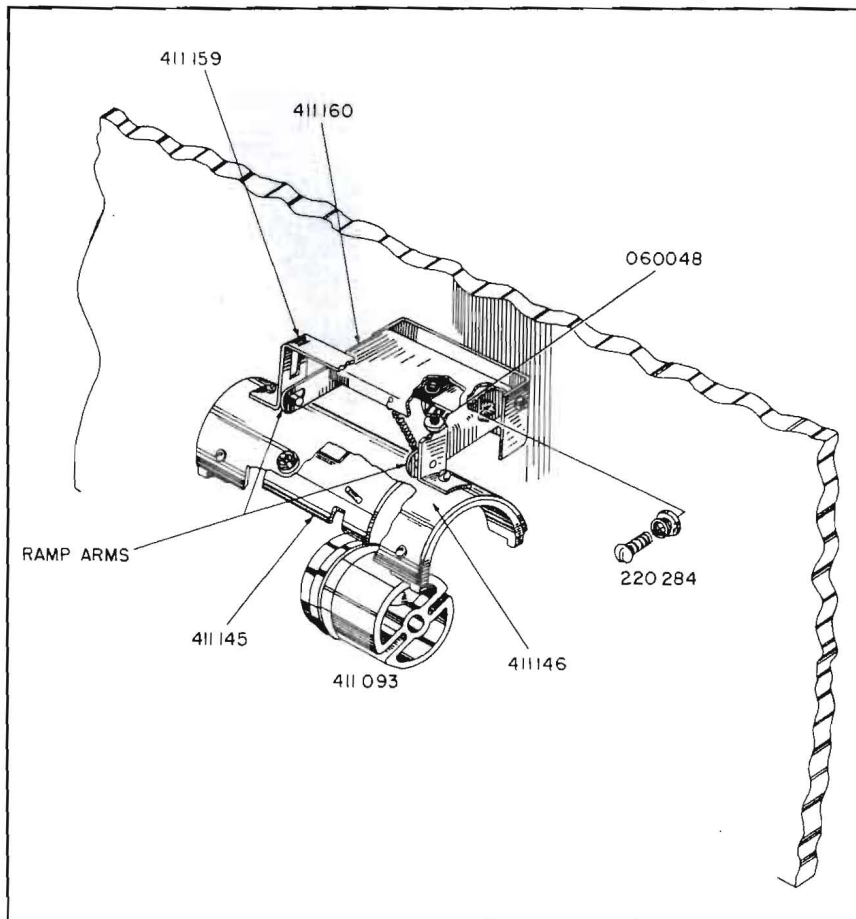


FIG. 19 Gate Assembly Adjustment

- (6) Screw in 060 048 ramp lifting screw (Figure 19) so that all play is just removed from gate and two shoes (no space between 250 115 flat washer and 120-144 retaining ring on shaft of shoe -Figure 20). Then, back off this screw approximately $\frac{1}{2}$ a turn. When LOAD-RUN lever is moved from RUN to LOAD, 411 162 elevator arm finger should now lift gate assembly a short distance before two shoes are lifted.
- (7) Now, with LOAD-RUN lever in RUN position, turn machine ON. Turn REC-STOP-

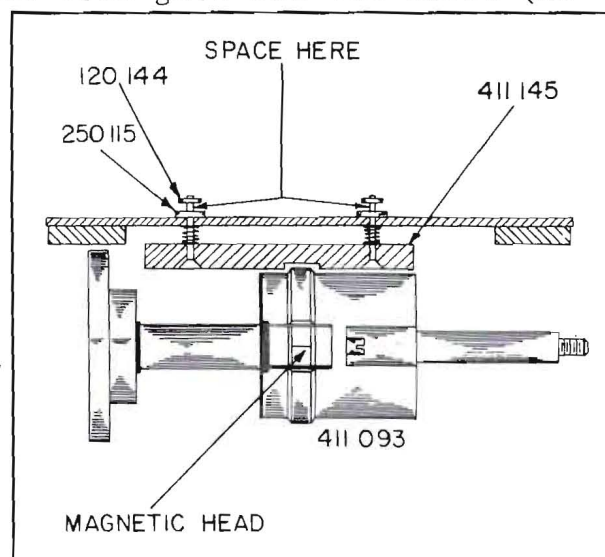


FIG. 20 Centering Magnetic Heads In Slots In Shoes of Gate Assembly

PLAY selector switch to REC position to START motor. Gate assembly may tilt up slightly to right but elevator arm finger should act as a stop on gate assembly, maintaining two magnetic heads centered in slots in shoes. Two ramp arms (especially left one) should not touch sides of 411 159 gate bridge assembly, thus acting as a stop themselves. If necessary, make further adjustments to elevator arm finger to center magnetic heads in slots in shoes of gate assembly (with machine running).

- (8) Now, connect a 50 ohm microphone (recommended type Electro-Voice Model 630 or Turner Model U9S) to mike input, and make a voice recording (with AVC switch in OFF position). Play back voice recording and check for good quality and negligible flutter and wow. If quality is not good, lower gate assembly, by screwing out ramp lifting screw another 1/8 turn, and make another test voice recording.

If the instructions outlined above are followed, and yet lowering or raising the gate assembly to various positions still gives inferior playback quality, a VISI-MAG check will have to be performed. VISI-MAG is the trade name for a solution which, when applied to magnetic recording tapes, makes visible the residual magnetic field. One pint cans of this solution, part number 180 541, are available from the SoundScriber Corporation. The instructions on the can must be carefully observed. Perform this VISI-MAG check as follows:

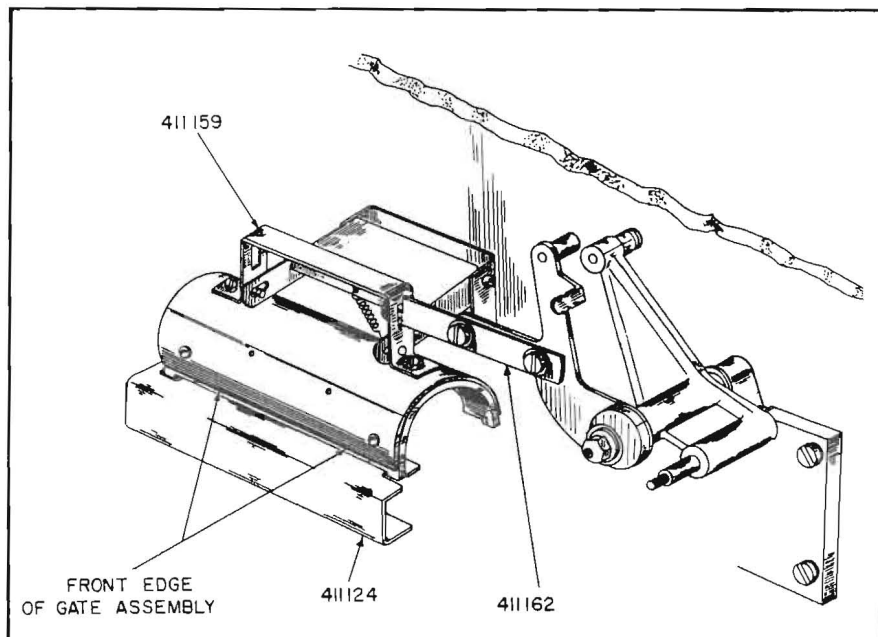


FIG. 21. 411162 Elevator Arm Finger Adjustment

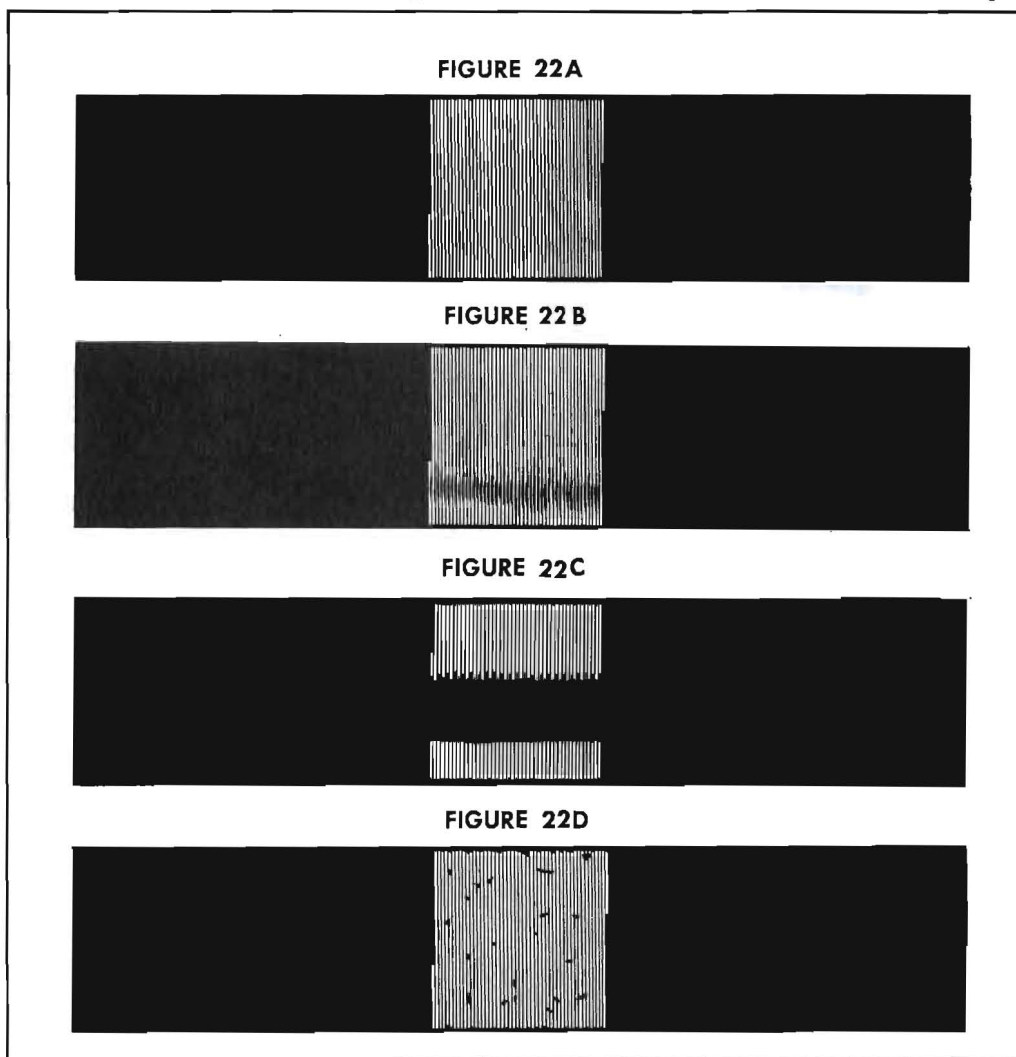
- (9) Load a clean demagnetized reel of spare tape on machine, connect a 1000 cycle signal generator to LINE INPUT terminals, set OFF-VOL control at approximately $\frac{1}{2}$ rotation, place AVC switch in OFF position, and connect a vacuum tube voltmeter or multimeter into monitor jack (set it on an AC range capable of reading $2\frac{1}{2}$ volts). Now, turn REC-STOP-PLAY selector switch to REC position, adjust signal generator control to indicate 2.5 volts AC on meter, and run approximately 2" of tape past magnetic heads. Cut off piece of test tape from machine and dip it into a can of VISI-MAG. Remove and let dry. Signal and head pattern will be visible on tape.

Figure 22 on following page illustrates four different types of head patterns which might be obtained from the VISI-MAG check described above.

Figure 22A illustrates a properly adjusted gate assembly. A VISI-MAG check revealing this type head pattern should give good qual-

ity playback.

Figure 22B illustrates a gate assembly that is either not quite down far enough or magnetic heads which need to be polished (note



section where width of head pattern is thin). When this type pattern is obtained, lower gate assembly slightly and repeat VISI-MAG check. If same defective pattern is repeated, polish heads. This is done with a 40 inch piece of polishing tape, part number 411 523, that is available from SoundScriber Corporation. Splice two ends of polishing

FIG. 22. Four VISI-MAG Magnetic Head Patterns

tape together (with a diagonal splice) to make a continuous loop. Load this loop on machine with abrasive side facing out. Now, with LOAD-RUN lever in RUN position, operate motor of machine for five minutes. Then, remove loop of polishing tape and repeat VISI-MAG check. If same defective pattern is again obtained, repeat this polishing operation for another 5 minutes. If a good VISI-MAG pattern cannot be obtained, change entire 411 146 gate assembly.

Figure 22C illustrates a gate assembly which is not down far enough. Entire center section of tape is not being contacted by magnetic heads. Lower gate assembly and repeat VISI-MAG check.

Figure 22D illustrates defective tape. Many small and large breaks in pattern will show up during playback as a "fluttery" condition. Change to another reel of tape.

SECTION XIII

SERVICE HINTS

1. Flywheel Guard

The proper reassembly of Flywheel Guard #411239 is important as any misalignment can cause drag on the #411040 Flywheel and shaft assembly. To avoid this situation proceed as follows:

Hold guard in position and tighten screws only slightly to hold in place. Apply a slight pressure to guard with the left hand, bearing to right side of machine, tighten each screw evenly approximately half turn until guard is secure. DO NOT TIGHTEN SCREWS DOWN, as this will cause guard to shift out of line and cause drag.

Should this occur loosen both screws and repeat procedure as above.

Note: On earlier model machines slotted head screws were used. On current machines #4 Allen screws are used.

2. Application of Guide Clip

Illustration below shows how Tape Guide Clip #411 246 is applied to #411 037 Guide Bar. The Guide Clips are being supplied to all S-124 Tape Recorders leaving the factory, beginning with Serial Number 420 640. It is designed to align tape with channel and eliminate kinked tape from entering channel to rotating magnetic heads.

The #411 246 Guide Clip is applicable to all S-124 new or old Tape Recorders.

NOTE: Besure Clip clears full roll of tape. The part #411 246 Clip can be obtained from the factory on request.

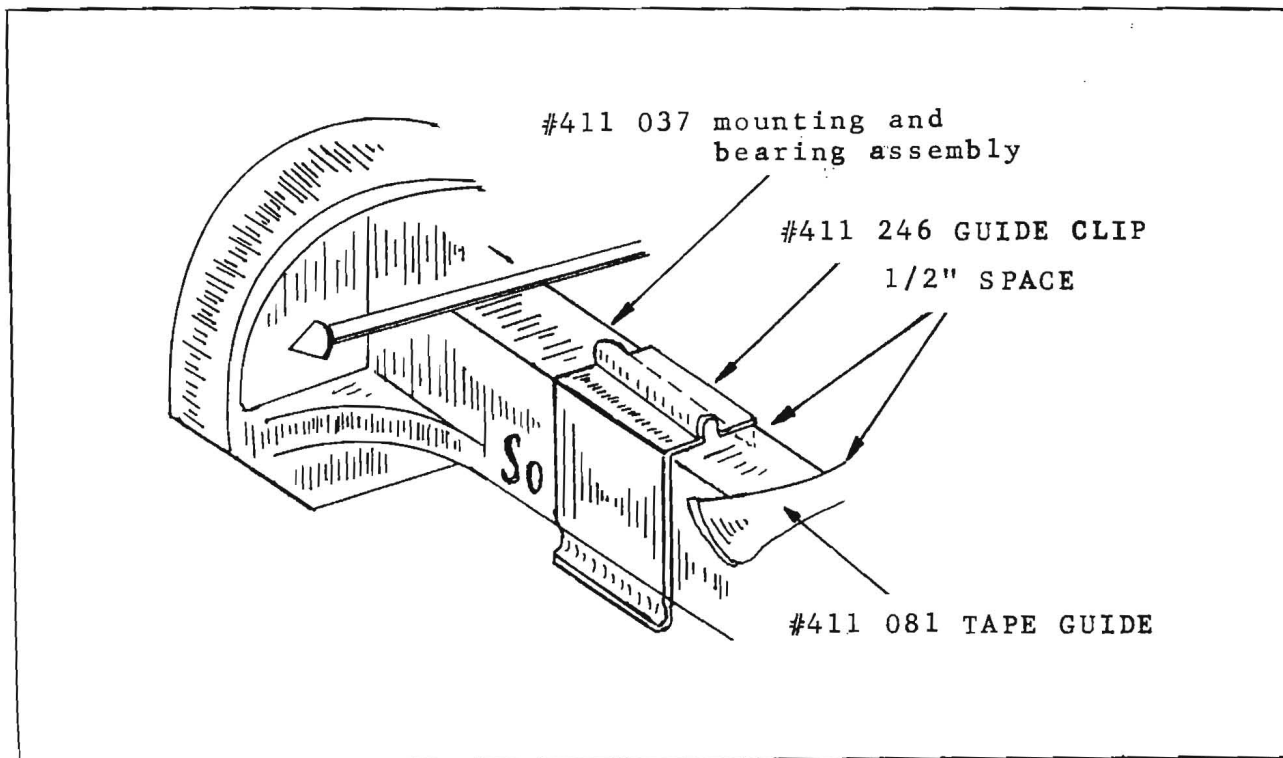


FIG. 23. Application of Guide Clip

1. Tape Take-Up

Should tape not take-up properly on "Take Up" Spool, take up spring #411 203 is slipping. If this trouble is encountered "Take Up" spring should be checked for correct tension. For proper tension hook a postal scale to handle of "Take Up" reel. with reel full, so that a reading of 2 1/2 - 3 ounces is obtained.

5. Intermittent Squeek of Brush Contacts

Brush contacts might squeek occassionally if oil or grease is allowed to collect on the slip rings, or if brush tip contact pressure is incorrect. To remedy the situation clean rings and contact tips with polishing paper, Part #411 523, and check for correct contact tip pressure according to instructions contained in Section XII Paragraph 1.

6. Wow and/on Flutter

The mechanical problem that will be encountered in the field that will either not be visually apparent or easily traced down will be the appearance of WOW and/ or FLUTTER in the RECORDING and PLAYBACK process. A description of what is meant by WOW and FLUTTER, a discussion of what parts in the machine can cause this trouble, and what steps to take to eliminate it are outlined in the paragraphs that follow.

- (a) WOW, a slow fluxation in the voice (or steady 1000 cycle test tone) heard during PLAYBACK, is caused by a SLOW VARIATION in the revolving speed of the 411 093 magnetic recording wheel assembly. WOW can be caused by any of the troubles that are outlined below.

- (1) DEFECTIVE 411 011 DRIVE GEAR FLEXIBLE COUPLING
If the coupling material becomes soft or torn, WOW (or FLUTTER) can develop. In this case, replace the coupling according to instructions contained in Section XI Paragraph 5.

- (2) BIND HINDERING THE FREE MOVEMENT OF THE 411 040 FLYWHEEL AND SHAFT ASSEMBLY
The 411 093 magnetic recording wheel assembly must be fastened on the shaft of the flywheel and shaft assembly allowing .005 inches "end Play" of the flywheel shaft. Additionally the flywheel shaft must have no bind in its bearings. To check for bearing bind, loosen the #8 allen set screw fastening the magnetic recording wheel assembly to the flywheel shaft, partially unscrew the flywheel and shaft assembly from the 411 011 drive gear flexible coupling, and rotate and slide the flywheel and shaft assembly back and forth to make sure no binds exist.

(3) TOO MUCH BRUSH PRESSURE AGAINST THE SLIP RINGS
OF THE 411 093 ASSEMBLY

When the magnetic recording wheel assembly is fastened to the shaft of the flywheel and shaft assembly, the loading of the brush tips should be no more than 1/16 of an inch and no less than 1/32 of an inch (See Section XII Paragraph 1, on how to check the brush tip contact loading). The brush tip contacts part number 260 238, are hemispherical in shape and have a graphite content to provide long contact life and prevent wear on the slip rings of the magnetic recording wheel assembly. When installing new contacts, light dress the tips with polishing paper to remove the plate. The brush tip contacts should also be checked to make sure they are not rubbing against the two screws fastening the printed circuit slip ring assembly to the magnetic recording wheel assembly.

- (b) FLUTTER, a fast fluctuation in the voice (or steady 1000 cycle test tone) heard during PLAYBACK, is caused by a FAST VARIATION in the revolving speed of the magnetic recording wheel assembly. Flutter can be caused by any of the troubles that are outlined below.

- (1) A DEFECTIVE 411 011 DRIVE GEAR FLEXIBLE COUPLING
A defective or torn drive gear flexible coupling will cause FLUTTER (it should be replaced, if torn, under any condition,) refer to Section XI, Paragraph 5 for replacement instruction.

- (2) IMPROPER THRUST OF 411 524 WORM DRIVE SHAFT
AGAINST 411 052 GEAR BOX THRUST SCREW.
If the worm drive shaft is not stopped against the gear box thrust screw, or if the 411 012 worm drive shaft flexible couplings are excessively compressed, flutter may result. Refer to Section XII, Paragraph 2, for the instructions on checking and adjusting the thrust of the worm drive shaft against the gear box thrust screw.

- (3) MISALIGNMENT OF MOTOR DRIVE SHAFT, 411 008
INTERMEDIATE SHAFT, AND 411 524 WORM DRIVE SHAFT.
These three components must be aligned in as near a straight line as possible. Misalignment sets up small unbalanced forces which can cause FLUTTER.

7. Trouble Shooting Amplifier

A schematic diagram of the Model S-124 Tape Recorder Reproducer (Figure 7 in Section IV) is included as a part of this SERVICE MANUAL. At the first sign of amplifier trouble, remove and CHECK each tube to immediately eliminate them as the cause of the trouble. Microphonism and tube noise, occurring mainly in the first amplifier stage, cannot be checked with a tube checker. Only by substituting another tube in place of the suspected defective tube can this trouble be found.

If an excessive hum is present, the trouble is probably being caused by a defect in one or more of the electrolytic filter block capacitors. To check the filter block capacitors, monitor the output and temporarily disconnect each section of the filter capacitor (one section at a time) and substitute a good capacitor of the same value in its place. If the hum is arising from within the amplifier itself, progressively ground the GRIDS of the various stages, working back from the power output stage, until you come to the stage where grounding the grid does not eliminate the hum. The trouble then lies somewhere in that stage. An oscillating condition can also be checked by this progressive grounding of the grids.

IMPORTANT NOTE

Due to the unusual design of the machine, in which the magnetic heads rotate in 360 degree path, stray electric and magnetic fields are picked up by the magnetic heads as they pass through these fields during the course of their rotation. Therefore, at FULL PLAYBACK gain, a moderately strong hum type of hum is present. However, at normal PLAYBACK levels, the strong PLAYBACK signal should so override this hum as to make the hum unnoticable.

If the amplifier is weak or dead, and the tubes check out O.K., check for proper plate and cathode voltages in each stage. Trouble here might indicate an open or shorted component, which could then be traced down by resistance measurements (with the equipment turned OFF). If the voltages check O.K., monitor the output of the machine and progressively touch each GRID, working back from the power output stage, with a screwdriver (with the metal part of the screwdriver held in your hand). The volume control should be on full when making this check. A click should be heard when touching the grid of the power output stage, and progressively louder sound should be heard when touching the grids of each preceding stage. If this method does not help, check for zero volts D.C. on each grid (turn the AVC switch OFF when making this check). The presence of any voltage indicates a leaking coupling capacitor, which should be replaced. If the voltage check on the grids shows no trouble, the trouble may lie in the output transformer. Remove one of the two primary leads of the output transformer in the machine and tie in the primary leads of a good output transformer. Attach the monitoring device to the secondary leads of the good output transformer and recheck the machine.

8. Distorted or Intermittent Recordings

- (1) The Amplifier should be checked out by monitoring a 1000 cycle test tone at the monitor jack.
- (2) A failure of the bias oscillation will cause trouble, first change the (V4) 12AT7 oscillator tube, then check for bias current, described in Section XII, Paragraph 5, this can be easily done to determine if the oscillator is functioning properly.
- (3) Dirty brush contacts or contacts not properly contacting the slip rings of the 411 093 magnetic recording wheel assembly can also cause intermittent recordings. These brush tip contacts can easily be cleaned and checked to eliminate this as the cause of trouble. (Refer to Paragraph 7 of this section).
- (4) Defective tape can also cause inferior recordings. Defective tape shows up as small breaks in the recording pattern, and these small breaks cause the playback quality to sound fluttery. Make a Visi-Mag check of a portion of the suspected tape (provided the gate assembly is properly set up) or substitute a known good reel of tape. The Visi-Mag test outlined in Section XII, Paragraph 6. A line drawing showing a bad Visi-Mag pattern, caused by a defective tape, is shown in Figure 22.
- (5) Should Gate not seat properly, inferior or distorted recordings may also occur. Proper contact will not be made between recording head and tape, move the 411 124 tape guide out as far as screws will allow, and tighten screws, should this not be sufficient, file the tape guide openings sufficiently to clear the prongs of the gate assembly when lowered. (Refer to Section XII, Paragraph 6) for adjustment of this assembly.
- (6) A worn 411 093 magnetic recording wheel assembly can cause inferior or distorted recordings and if badly worn can result in no recording at all due to loss of proper physical contact between magnetic heads and tape. Replace assembly according to instructions outlined in Section XI, Paragraph 3.

9. Failure to Record

When machine fails to record check the following:

- (a) Check power cord.
- (b) Check fuse
- (c) Check tubes
- (d) Check (Power supply)(Amplifier)(Oscillator) Section of machine to see if voltages are present. See paragraph 8 this section.
- (e) Check Selector Switch contacts clean if dirty or pitted.
- (f) Check for obvious damage to components.
- (g) Check for open or shorted components.
- (h) Check input connections.

ERRATA SHEET

NOTICE

SERVICE MANUAL KS-16746 LIST 3

SOUNDScriBER MODEL S-124 TAPE RECORDER

Section XIV Illustrated Parts Breakdown pages were incorrectly numbered. Please cross out the page numbers and renumber as follows:

Page 65 should be 1

Page 66 should be 2

Page 67 should be 3

and so on through Page 100

This is necessary in order to have page numbers agree with the cross index for Section 3 Alphabetical Parts Reference Index and Section 4 Numerical Index.

AWH;eb

6/1/59

MANUFACTURED BY
THE SOUNSCRIBER CORPORATION
NORTH HAVEN, CONN.

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SECTION XIV

ILLUSTRATED PARTS BREAKDOWN

TABLE OF CONTENTS

Section	Page
I INTRODUCTION	3
II GROUP ASSEMBLY ILLUSTRATIONS	5
III ALPHABETICAL PARTS REFERENCE INDEX	21
IV NUMERICAL INDEX	31

INTRODUCTION

1. GENERAL

- A. The Group Assembly Illustrations (Section II) divide the Model "S-124" Tape Recorder-Reproducer into various assemblies, sub assemblies, and detail parts. A parts list accompanies each illustration. These illustrations provide complete identification for all parts of the Model "S-124" Tape Recorder-Reproducer. SoundScriber part numbers are used exclusively throughout to identify parts.
- B. The Alphabetical Parts Reference Index (Section III) contains a complete *alphabetically* arranged descriptive list of all parts illustrated. Each part in this list is cross-referenced with its particular illustration (page number and item number given).
- C. The Numerical Index (Section IV) contains a complete *numerically* arranged list of all parts illustrated. Each part in this list is cross-referenced with its particular illustration (page number and item number given).

2. HOW TO USE ILLUSTRATED PARTS BREAKDOWN

- A. How To Find Part Number If Section Of Tape Recorder In Which Part Is Used Is Known.
 - (1) Turn to index of Group Assembly Illustrations on page 5 and find page number of illustration in which part is used.
 - (2) Turn to page determined in step (1) above.
 - (3) Locate part and its item number on illustration.
 - (4) Find item number on parts list to determine complete description.
- B. How To Find Portion Of Tape Recorder In Which Part Is Assembled If Part Number Is Known.
 - (1) Refer to Section IV, Numerical Index, and find item number and page number where part is illustrated.
 - (2) Turn to page determined in step (1) above and locate item number on illustration.
 - (3) Find item number on parts list to determine complete description.
- C. How To Find Part Number And/Or Portion Of Tape Recorder In Which Part Is Assembled Of Any Unknown Part.
 - (1) Decide what proper description of part should be i.e. screw, capacitor, pin, spring, etc.
 - (2) Refer to Section III, Alphabetical Parts Reference Index, and find description that corresponds to part.
 - (3) Determine item number and page number where part is located.
 - (4) Turn to page determined in step (3) above and locate item number on illustration.
 - (5) Find item number on parts list to determine complete description.

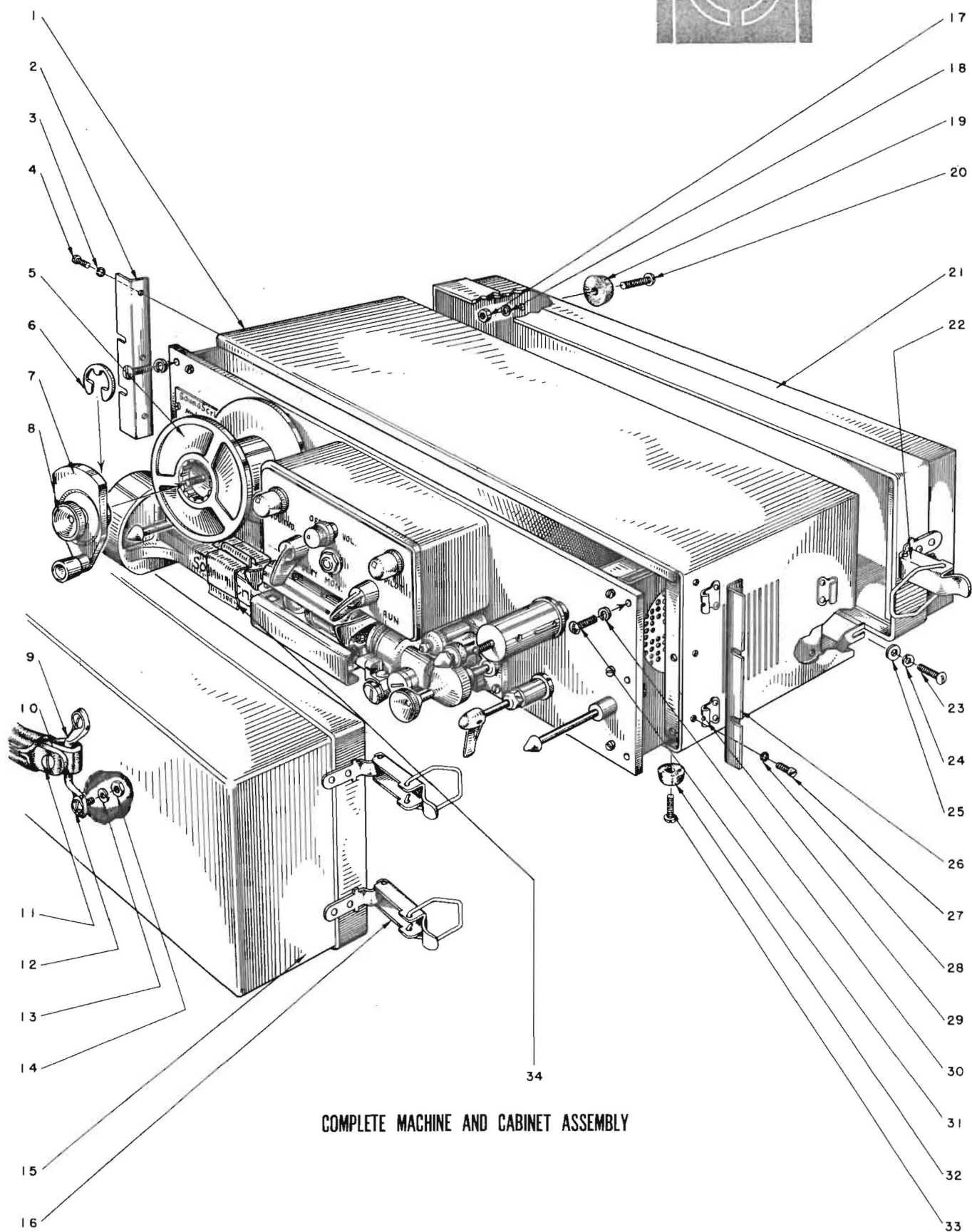
(SECTION 2)

GROUP ASSEMBLY ILLUSTRATIONS

Plate No.	Illustration	Page
1.	COMPLETE MACHINE AND CABINET ASSEMBLY	7
2.	LEFT FRONT MECHANICAL ASSEMBLY	9
3.	CENTER FRONT MECHANICAL ASSEMBLY	11
4.	RIGHT FRONT MECHANICAL ASSEMBLY	13
5.	TOP AMPLIFIER CHASSIS ASSEMBLY	15
6.	BOTTOM AMPLIFIER CHASSIS ASSEMBLY	17
7.	BOTTOM AMPLIFIER CHASSIS ASSEMBLY (Continued)	19

p a r t s l i s t 1

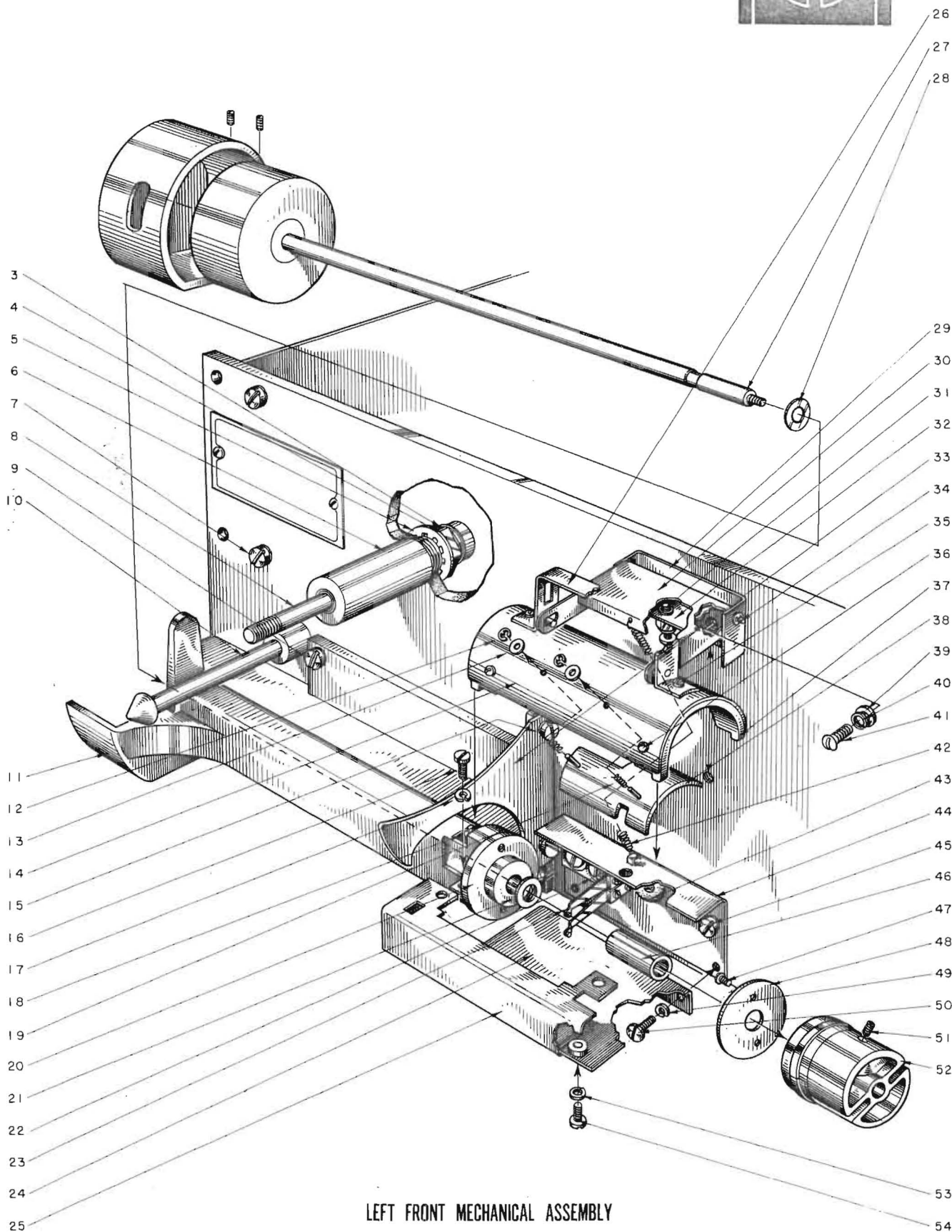
Item Number	Part Number		Description
1	411	226	Cabinet Assembly (Less Rubber Feet)
2	411	221	Bracket, Left Hand, Rack Mounting
3	090	180	Washer, Lock, #8
4	220	308	Screw, Binding Head, 8 - 32 x $\frac{3}{8}$
5	411	106	Reel Assembly, 3 $\frac{3}{4}$ " Diameter
6	120	161	Ring, Retaining, "E" 5133-62
7	411	080	Crank Assembly, Reel (Includes Knob and Retaining Ring)
8	411	064	Knob, Reel Crank
9	411	214	Loop, Footman's (Handle)
10	411	213	Handle, Top Cover
11	411	215	Post, 8 - 32 Threads (Handle)
	411	216	Screw, Truss Head, 8 - 32 x $\frac{3}{8}$ (Handle)
12	220	301	Screw, Oval Head, 10 - 32 x $\frac{3}{8}$
13	090	020	Washer, Lock, #10
14	190	112	Nut, Hex, 10 - 32
15	411	227	Assembly, Top (Less Footman's Loop and Handle)
16	260	361	Catch, Top and Bottom Cover
17	090	047	Nut, Hex, 6 - 32
18	090	048	Washer, Lock, #6
19	260	149	Foot, Rubber
20	090	183	Screw, Round Head, 6 - 32 x $\frac{3}{8}$
21	411	228	Assembly, Bottom (Less Rubber Feet)
22	260	361	Catch, Top and Bottom Cover
23	090	183	Screw, Round Head, 6 - 32 x $\frac{3}{8}$
24	090	048	Washer, Lock, #6
25	090	069	Washer, Flat, #6
26	411	222	Bracket, Right Hand, Rack Mounting
27	220	308	Screw, Binding Head, 8 - 32 x $\frac{3}{8}$
28	090	180	Washer, Lock, #8
29	260	362	Strike, Cabinet Assembly
30	090	180	Washer, Lock, #8
31	220	290	Screw, Binding Head, 8 - 32 x $\frac{1}{2}$
32	260	149	Foot, Rubber
33	090	046	Screw, Round Head, 6 - 32 x $\frac{1}{4}$
34	411	246	Guide, Clip



COMPLETE MACHINE AND CABINET ASSEMBLY

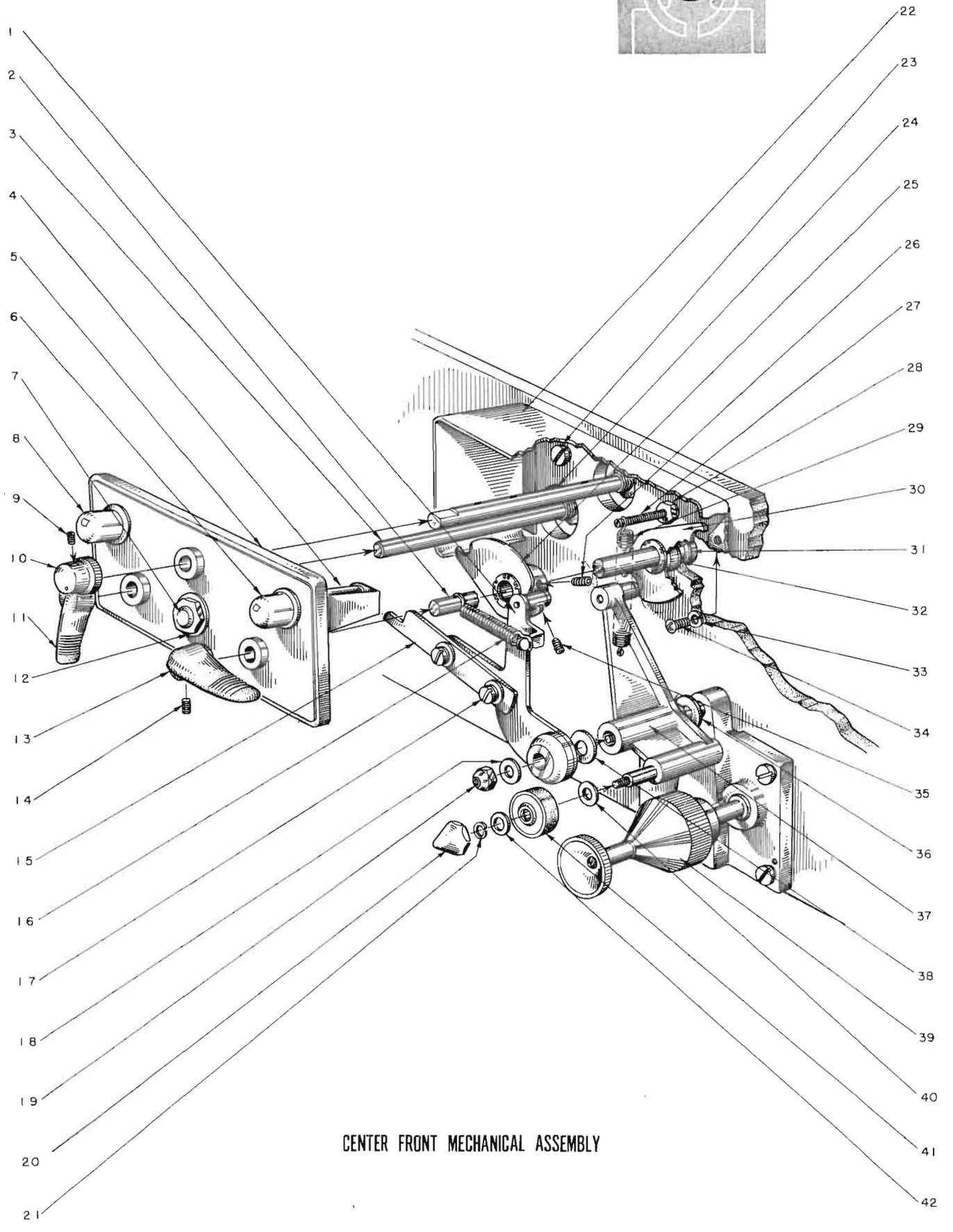
p a r t s l i s t 2

Item Number	Part Number		Description
1	220	295	Screw, Slotted Head, 4 - 40 x $\frac{1}{4}$
2	411	239	Guard, Flywheel
3	409	043	Washer, Flat, .260 I.D. x $\frac{11}{16}$ O.D.
4	190	187	Nut, Hex, $\frac{5}{8}$ - 18
5	250	355	Washer, Internal Star Lock, $\frac{5}{8}$ " Bolt Size
6	411	013	Bearing Assembly, Spindles
7	220	128	Screw, Binding Head, 6 - 32 x $\frac{1}{2}$
	090	048	Washer, Lock, #6
8	411	092	Shaft Assembly, Feed Reel
9	220	128	Screw, Binding Head, 6 - 32 x $\frac{1}{2}$
	090	048	Washer, Lock, #6
10	411	028	Post Assembly, Guide
11	411	037	Mounting and Bearing Assembly
12	120	144	Ring, Retaining, "E" 5133-9
13	250	115	Washer, Flat, #3
14	411	127	Shield, Gate Assembly
15	220	284	Screw, Binding Head, 6 - 32 x $\frac{5}{16}$
	090	048	Washer, Lock, #6
16	090	046	Screw, Round Head, 6 - 32 x $\frac{1}{4}$
17	090	048	Washer, Lock, #6
18	220	110	Screw, Round Head, 4 - 40 x $\frac{1}{2}$
	250	322	Washer, Flat, #4
	090	528	Washer, Lock, #4
19	411	132	Spring, Gate Shoe
20	411	091	Bearing, Mounting and Bearing Assembly
21	250	356	Washer, Flat, .252 I.D. x $\frac{1}{2}$ O.D.
22	220	284	Screw, Binding Head, 6 - 32 x $\frac{5}{16}$
	090	048	Washer, Lock, #6
	090	069	Washer, Flat, #6
23	411	205	Brush and Lead Assembly, Magnetic Recording Wheel
24	411	172	Shield Assembly, Bottom
25	411	124	Guide, Front Tape
26	411	159	Bridge Assembly, Gate Assembly
27	411	040	Flywheel and Shaft Assembly
28	250	356	Washer, Flat, .252 I.D. x $\frac{1}{2}$ O.D.
29	411	158	Bracket, Hinge, Ramp Assembly
30	411	160	Ramp, Ramp Assembly
31	060	048	Screw, Round Head, 6 - 32 x $\frac{1}{2}$
32	411	149	Ramp Stop Assembly
33	411	081	Guide, Tape
34	411	129	Rod, Ramp Assembly
	120	144	Ring, Retaining, "E" 5133-9
35	090	176	Washer, Lock, #3
	091	179	Screw, Round Head, 3 - 48 x $\frac{3}{16}$
36	090	176	Washer, Lock, #3
	091	179	Screw, Round Head, 3 - 48 x $\frac{3}{16}$
37	411	128	Guide, Tape, Gate Assembly
38	411	145	Shoe Assembly, Gate Assembly
39	090	069	Washer, Flat, #6
40	090	048	Washer, Lock, #6
41	220	284	Screw, Binding Head, 6 - 32 x $\frac{5}{16}$
42	411	200	Spring, Ramp Assembly
43	090	080	Grommet, Rubber, $\frac{5}{16}$ I.D. x $\frac{5}{8}$ " O.D., Mounts in $\frac{3}{8}$ " Hole
44	411	140	Shield, Rear
45	220	284	Screw, Binding Head, 6 - 32 x $\frac{5}{16}$
	090	048	Washer, Lock, #6
46	411	154	Spacer, Fiber, Magnetic Recording Wheel Assembly
47	220	287	Screw, Round Head, 0 - 80 x $\frac{1}{8}$
48	411	095	Slip Rings, Printed Circuit, Magnetic Recording Wheel Assembly
49	090	048	Washer, Lock, #6
50	220	284	Screw, Binding Head, 6 - 32 x $\frac{5}{16}$
51	220	194	Screw, Allen Set, 8 - 32 x $\frac{1}{4}$
52	411	093	Magnetic Recording Wheel Assembly (Including #8 Allen Set Screw)
53	090	048	Washer, Lock, #6
54	090	046	Screw, Round Head, 6 - 32 x $\frac{1}{4}$



p a r t s l i s t 3

Item Number	Part Number		Description
1	411	135	Elevator Arm Assembly
2	411	170	Shaft Assembly, Controls
3	130	130	Switch, Selector, 9 Poles, 3 Poles/Deck, 3 Decks, 2 Decks Non-Shorting, One Deck Shorting, 30° Indexing
4	150	176	Pilot Light Assembly, Green (Power Indicator)
5	411	522	Panel Assembly, Front
6	240	319	Lamp, Incandescent, Westinghouse #1815, 12 Volts, 20 Amperes, Bayonette Type
7	150	149	Jack, Open Circuit, Two Conductor (Monitor)
8	150	177	Pilot Light Assembly, Clear (Recording Level Indicator)
	240	313	Lamp, Neon, Type NE-51, 105-125 Volts, Bayonette Type
9	091	133	Screw, Allen Set, 8 - 32 x $\frac{3}{16}$
10	260	236	Knob, Round, With #8 Allen Set Screw
11	260	235	Knob, Long, With #8 Allen Set Screw
12	250	106	Washer, Shoulder, .375 I.D. x $\frac{3}{4}$ O.D.
	250	107	Washer, Flat, .375 I.D. x $\frac{3}{4}$ O.D.
	250	125	Washer, Fiber, .515 I.D. x $\frac{7}{8}$ O.D.
13	260	235	Knob, Long, With #8 Allen Set Screw
14	091	133	Screw, Allen Set, 8 - 32 x $\frac{3}{16}$
15	411	162	Finger, Elevator Arm Assembly
16	411	202	Spring, Elevator Arm Assembly
17	220	284	Screw, Binding Head, 6 - 32 x $\frac{5}{16}$
	090	048	Washer, Lock, #6
	090	069	Washer, Flat, #6
18	090	069	Washer, Flat, #6
19	190	188	Nut, ESNA Hex, 6 - 32
20	411	048	Nut, Crown, 6 - 32
21	090	048	Washer, Lock, #6
22	411	119	Casing, Front Panel
23	220	128	Screw, Binding Head, 6 - 32 x $\frac{1}{2}$
	090	048	Washer, Lock, #6
24 (R8)	210	451	Potentiometer, Dual With Switch, Front Section 500,000 Ohms, Rear Section 5000 Ohms.
25	411	118	Cam and Hub Assembly (Less #8 Allen Set Screw)
26	220	194	Screw, Allen Set, 8 - 32 x $\frac{1}{4}$
27	220	291	Screw, Slotted Head, 6 - 32 x $1\frac{1}{4}$
28	090	047	Nut, Hex, 6 - 32
	090	048	Washer, Lock, #6
29	411	072	Spring, Pressure Roller Unit Assembly
30	411	118	Cam and Hub Assembly (Less #8 Allen Set Screw)
31	250	356	Washer, Flat, .252 I.D. x $\frac{1}{2}$ " O.D.
32	250	356	Washer, Flat, .252 I.D. x $\frac{1}{2}$ " O.D.
33	090	048	Washer, Lock, #6
34	090	046	Screw, Round Head, 6 - 32 x $\frac{1}{4}$
35	220	194	Screw, Allen Set, 8 - 32 x $\frac{1}{4}$
36	250	356	Washer, Flat, .252 I.D. x $\frac{1}{2}$ " O.D.
37	411	521	Pressure Roller Unit Assembly
38	250	356	Washer, Flat, .252 I.D. x $\frac{1}{2}$ " O.D.
39	411	066	Drive Roller and Shaft Assembly
40	250	352	Washer, Flat, .183 I.D. x $\frac{3}{8}$ O.D.
41	411	111	Roller Assembly, Pressure, Rubber
42	250	352	Washer, Flat, .183 I.D. x $\frac{3}{8}$ O.D.

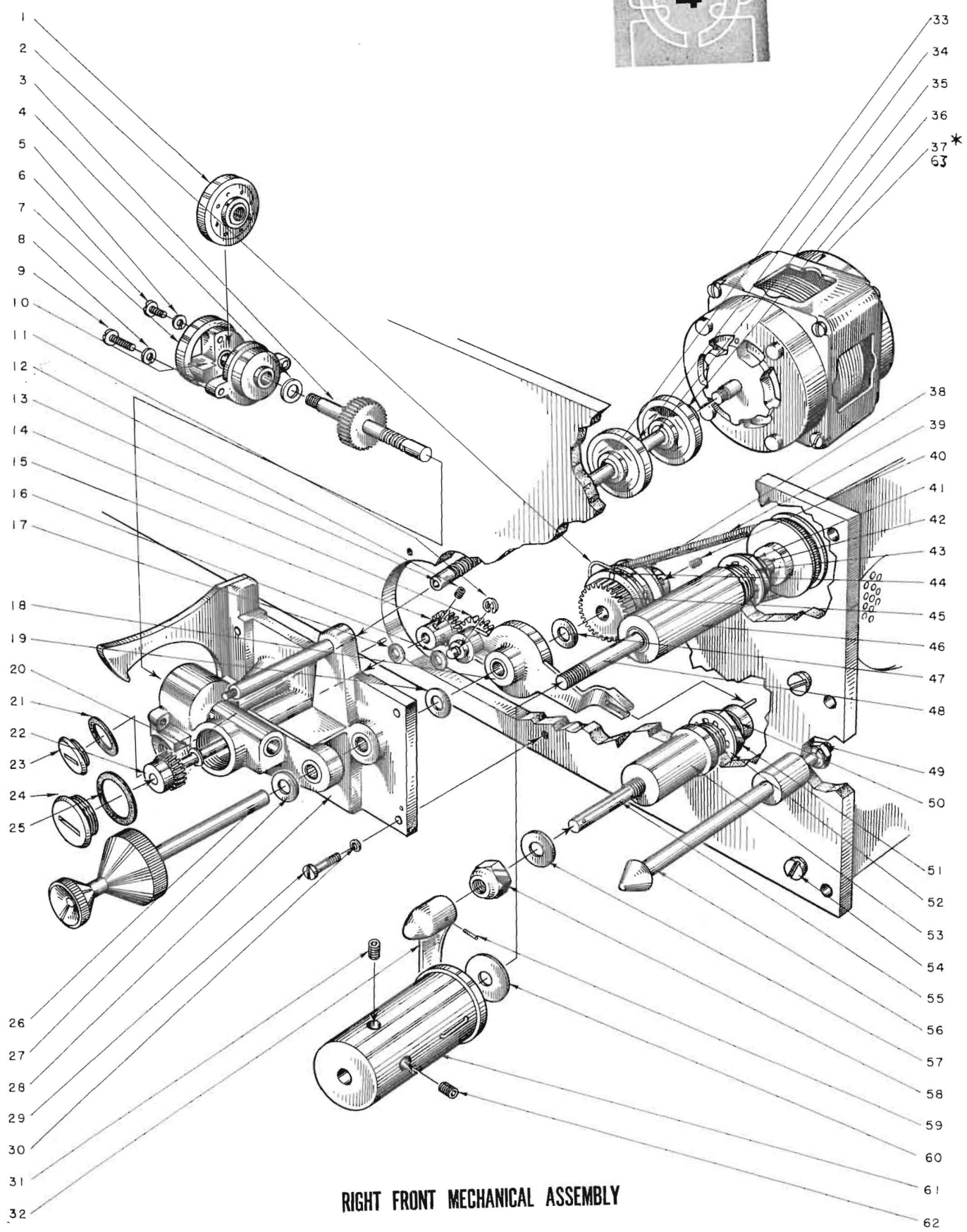


CENTER FRONT MECHANICAL ASSEMBLY

p a r t s l i s t 4

Item Number	Part Number		Description
1	411	011	Coupling, Flexible, 10 - 32 Left Hand Thread (30 R.P.M. Drive Gear)
2	411	078	Spring, Roller Dog
3	411	197	Gear, Drive, 30 R.P.M.
4	250	356	Washer, Flat, .252 I.D. x $\frac{1}{2}$ O.D.
5	090	048	Washer, Lock, #6
6	220	284	Screw, Binding Head, 6 - 32 x $\frac{5}{16}$
7	411	039	Ring, Tape Guide (Outboard Bearing Assembly)
8	090	048	Washer, Lock, #6
9	220	128	Screw, Binding Head, 6 - 32 x $\frac{1}{2}$
10	411	083	Outboard Bearing Assembly
11	120	126	Ring, Retaining, "E" 5133-18
12	091	133	Screw, Allen Set, 8 - 32 x $\frac{3}{16}$
13	260	237	Ball, Steel, $\frac{5}{32}$ " Diameter (Worm Drive Shaft)
14	411	085	Gear, Intermediate Spur, Tuner Lever Assembly
15	411	024	Gear, Spur
16	250	352	Washer, Flat, .183 I.D. x $\frac{3}{8}$ O.D.
17	250	352	Washer, Flat, .183 I.D. x $\frac{3}{8}$ O.D.
18	411	073	Tuner Lever Assembly
19	250	356	Washer, Flat, .252 I.D. x $\frac{1}{2}$ O.D.
20	250	352	Washer, Flat, .183 I.D. x $\frac{3}{8}$ O.D.
21	411	055	Gasket, Thrust Screw Assembly
22	411	183	Gear and Shaft Assembly
23	411	052	Screw Assembly, Thrust
24	411	049	Screw Assembly, Plug
25	411	051	Gasket, Screw Plug Assembly
26	411	066	Drive Roller and Shaft Assembly
27	250	356	Washer, Flat, .252 I.D. x $\frac{1}{2}$ O.D.
28	411	088	Gear Box and Bearing Assembly
29	220	128	Screw, Binding Head, 6 - 32 x $\frac{1}{2}$
30	090	048	Washer, Lock, #6
31	220	194	Screw, Allen Set, 8 - 32 x $\frac{1}{4}$
32	411	165	Lever, Tuning
33	411	524	Shaft, Drive, Worm (With 260 237 Steel Ball)
34	411	012	Coupling, Flexible, 10 - 32 Right Hand Threads (Worm Drive Shaft)
35	411	008	Shaft, Intermediate
36	411	012	Coupling, Flexible, 10 - 32 Right Hand Threads (Worm Drive Shaft)
* 37	411	075	Motor, Synchronous, Howard Industries Type SWC-9206-1, 115 Volts, 60 Cycles, 1800 R.P.M.
38	411	062	Pulley, Drive Roller and Shaft Assembly (Less #8 Allen Set Screw)
39	411	203	Spring Belt, Take Up Reel
40	091	133	Screw, Allen Set, 8 - 32 x $\frac{3}{16}$
41	190	187	Nut, Hex, $\frac{5}{8}$ - 18
42	409	043	Washer, Flat, .260 I.D. x $\frac{11}{16}$ O.D.
43	250	355	Washer, Internal Star Lock, $\frac{5}{8}$ " Bolt Size
44	411	063	Dog, Roller, Spur Gear, Drive Roller and Shaft Assembly
45	411	061	Gear, Spur, Drive Roller and Shaft Assembly
46	411	013	Bearing Assembly, Spindles
47	250	356	Washer, Flat, .252 I.D. x $\frac{1}{2}$ O.D.
48	411	056	Shaft Assembly, Take Up Reel
49	190	112	Nut, Hex, 10 - 32
	090	020	Washer, Lock, #10
50	250	349	Washer, Spring, .252 I.D. x $\frac{1}{2}$ O.D.
	250	356	Washer, Flat, .252 I.D. x $\frac{1}{2}$ O.D.
51	190	187	Nut, Hex, $\frac{5}{8}$ - 18
52	250	355	Washer, Internal Star Lock, $\frac{5}{8}$ " Bolt Size
53	411	071	Bearing, Tuner Control
54	220	128	Screw, Binding Head, 6 - 32 x $\frac{1}{2}$
	090	048	Washer, Lock, #6
55	411	188	Shaft Assembly, Eccentric, Tuning Lever
56	411	028	Post Assembly, Guide
57	250	356	Washer, Flat, .252 I.D. x $\frac{1}{2}$ O.D.
58	190	189	Nut, ESNA Hex, $\frac{1}{4}$ - 28
59	120	209	Pin, Roll, .066 " Diameter x $\frac{3}{8}$ Long
60	409	043	Washer, Flat, .260 I.D. x $\frac{11}{16}$ O.D.
61	411	079	Mandrel Assembly, Reels (Less #8 Allen Set Screws)
62	220	194	Screw, Allen Set, 8 - 32 x $\frac{1}{4}$
* 63	411	267	Washer, Flat, .320 I.D. x 500 O.D., (Nylon)

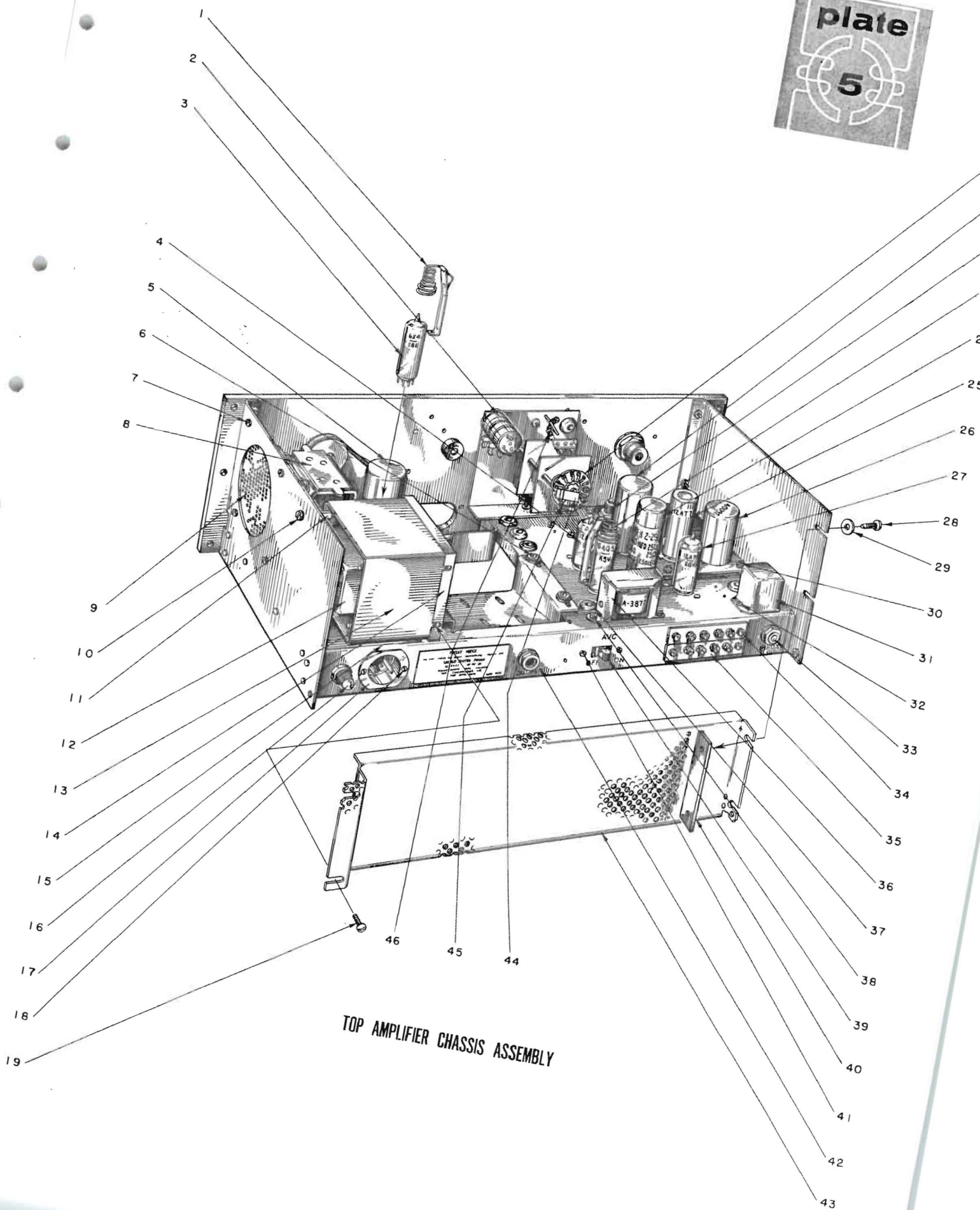
* Item 37 - 411 075 Sleeve Type Motor is being replaced with number 411 266 Ball Bearing Type Motors.



RIGHT FRONT MECHANICAL ASSEMBLY

p a r t s l i s t 5

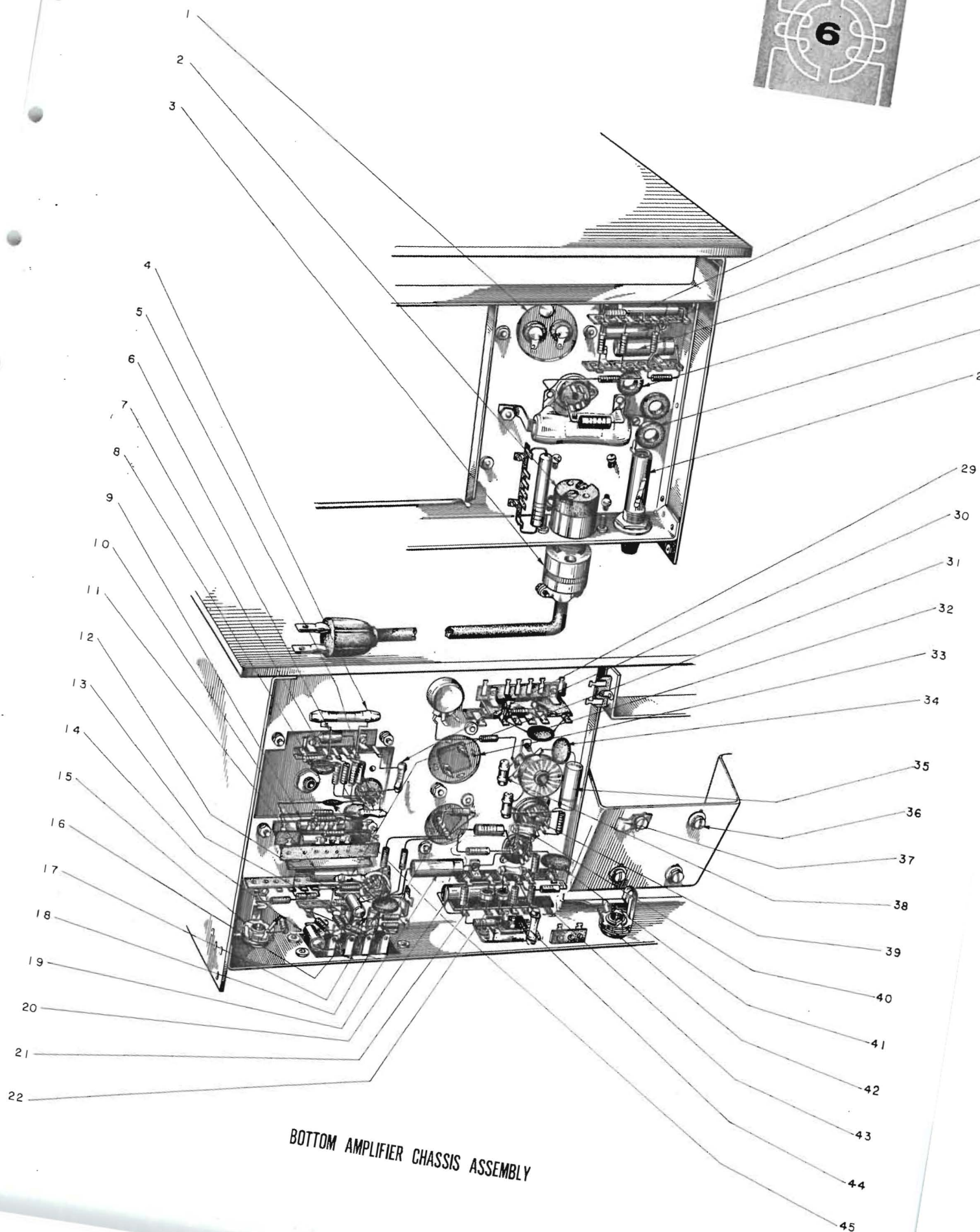
Item Number	Part Number		Description
1	260	160	Tube Retainer
2 (R8)	210	451	Potentiometer, Dual W/Switch, Front Section 500,000 Ohms, Rear Section 5000 Ohms
3 (V5)	240	145	Tube, Vacuum, 6X4
4 (V4)	240	123	Tube, Vacuum, 12AT7
5 (C28)	100	201	Capacitor, 1.50 Mfd., 330 VAC, Can Type, Cornell Dubilier, Motor Start
6	220	128	Screw, Binding Head, 6 - 32 x $\frac{1}{2}$
	260	223	Grommet, Rubber, $\frac{3}{16}$ I.D. x $\frac{1}{2}$ O.D., Mounts in $\frac{5}{16}$ " Hole
	260	359	Spacer, .144 I.D. x .203 O.D., $\frac{17}{64}$ Long
	090	048	Washer, Lock, #6
	090	069	Washer, Flat, #6
7	220	284	Screw, Binding Head, 6 - 32 x $\frac{5}{16}$
	090	047	Nut, Hex, 6 - 32
	090	048	Washer, Lock, #6
8	230	104	Speaker, 3", Oxford #3CM-25
9	411	242	Screen, Speaker
10	220	289	Screw, Binding Head, 8 - 32 x $\frac{5}{16}$
	090	180	Washer, Lock, #8
11	411	182	Bushing, Hex, 8 - 32 x $\frac{3}{4}$ " Long
12	170	138	Transformer, Power, 350-0-350 Volts at .070 Ampere Secondary Winding, 6.3 V.C.T. Secondary Winding, 115 Volt, 60 Cycle Primary Winding
13	411	178	Shield Assembly, Power Transformer
14	411	181	Cover, Transformer Shield
15	411	176	Base Assembly, Power Transformer
16	060	017	Fuse, 3 Amp, 250 Volt, Type 3AG
	060	530	Post, Fuse Holder, Type 3AG
17	150	369	Receptacle, Power, Twist-Lock
18	090	046	Screw, Round Head, 6 - 32 x $\frac{1}{4}$
	090	048	Washer, Lock, #6
19	090	690	Screw, Binding Head, #6 Self-Tapping
20	130	130	Switch, Selector, 9 Poles, 3 Poles/Deck, 3 Decks, 2 Decks Non Shorting, 1 Deck Shorting, 30° Indexing
21 (C30)	100	197	Capacitor, Dual 40 x 40 Mfd., 450 V.D.C., Elect.
22 (R31)	210	452	Potentiometer, 20,000 Ohms, Linear Taper
23 (V3)	240	144	Tube, Vacuum, 6AQ5
	260	160	Tube Retainer
24 (C29)	100	196	Capacitor, Dual 40 x 40 Mfd., 250 V.D.C., Elect.
25 (V1)	240	123	Tube, Vacuum, 12AT7
	260	313	Shield, Tube, Miniature Type
26	170	142	Transformer, Input, Triad #40,092, 150 Ohm Primary Impedance, 60,000 Ohm Secondary Impedance
27 (V2)	240	123	Tube, Vacuum, 12AT7
28	090	046	Screw, Round Head, 6 - 32 x $\frac{1}{4}$
29	090	069	Washer, Flat, #6
30	220	134	Screw, Fillister Head, 4 - 40 x $\frac{5}{8}$
	250	322	Washer, Flat, #4
	090	529	Nut, Hex, 4 - 40
	090	806	Grommet, Rubber, $\frac{3}{32}$ I.D. x $\frac{5}{16}$ O.D., Mounts in $\frac{3}{16}$ " Hole
31	170	100	Transformer, Input, 50,000 Ohm Primary Impedance, 50 Ohm Secondary Impedance
32	090	032	Nut, Hex, 3 - 48
	090	065	Screw, Round Head, 3 - 48 x $\frac{1}{4}$
	090	176	Washer, Lock, #3
33	150	368	Jack, One Normally Closed Circuit, 2 Conductor
	250	106	Washer, Shoulder, .375 I.D. x $\frac{3}{4}$ O.D.
	250	107	Washer, Flat, .375 I.D. x $\frac{3}{4}$ O.D.
34	090	046	Screw, Round Head, 6 - 32 x $\frac{1}{4}$
	090	048	Washer, Lock, #6
35	150	184	Terminal Strip, 4 Lugs
36	170	143	Transformer, Output, Chicago Type A-3877, 5000 Ohm Primary Impedance, 4 Ohm Nominal Secondary Impedance
37	090	080	Grommet, Rubber, $\frac{5}{16}$ I.D. x $\frac{5}{8}$ O.D., Mounts in $\frac{3}{8}$ " Hole
38	090	046	Screw, Round Head, 6 - 32 x $\frac{1}{4}$
	090	048	Washer, Lock, #6
39	130	131	Switch, Slide (AVC Switch), SPST
40	411	217	Plate, Nut (Rear Screen)
41	090	032	Nut, Hex, 3 - 48
	090	065	Screw, Round Head, 3 - 48 x $\frac{1}{4}$
	090	176	Washer, Lock, #3
42	150	368	Jack, One Normally Closed Circuit, 2 Conductor
	250	106	Washer, Shoulder, .375 I.D. x $\frac{3}{4}$ O.D.
	250	107	Washer, Flat, .375 I.D. x $\frac{3}{4}$ O.D.
43	411	218	Screen, Rear
44	100	233	Capacitor, .25 Mfd., 400 V.D.C.,
45	210	484	Resistor, 15 Ohms, $\frac{1}{2}$ W
46	210	133	Resistor, 33 Ohms, $\frac{1}{2}$ W



TOP AMPLIFIER CHASSIS ASSEMBLY

p a r t s l i s t 6

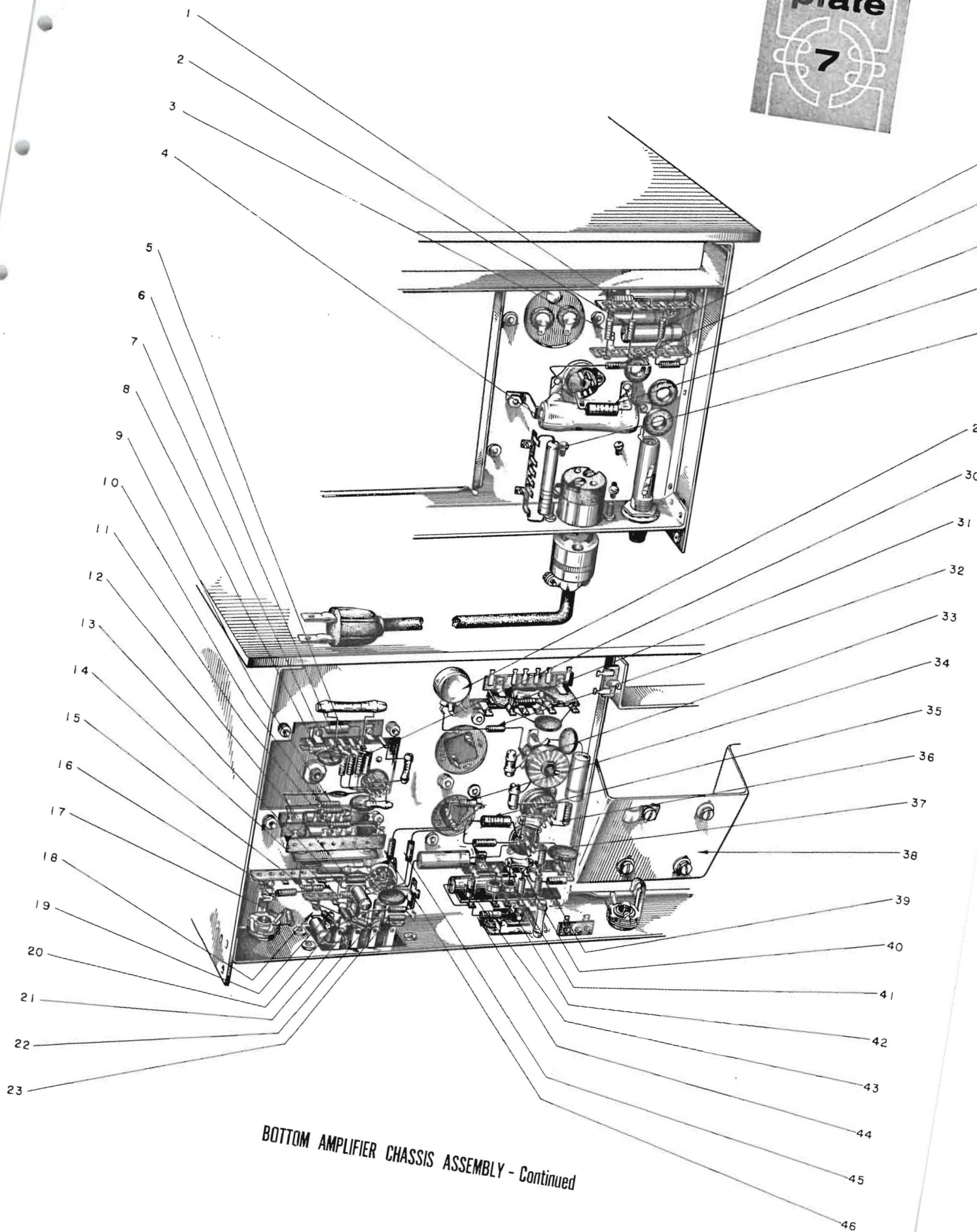
Item Number		Part Number	Description
1	(C28)	100 201	Capacitor, 1.50 Mfd., 330 VAC., Can Type, Cornell Dubilier, Motor Start
2		150 369	Receptacle, Power, Twist-Lock
3		411 006	Cable Assembly, Power
4	(C5)	100 204	Capacitor, .003 Mfd., 600 V.D.C., Tubular
5	(C7)	100 198	Capacitor, .00047 Mfd., 600 V.D.C., Tubular
6	(C10)	100 165	Capacitor, .25 Mfd., Metalized Paper, 200 V.D.C.
7	(C9)	100 149	Capacitor, .01 Mfd., 600 V.D.C., Disc
8	(C6)	100 203	Capacitor, .005 Mfd., 600 V.D.C., Disc
9	(C8)	100 119	Capacitor, 50 Mfd., 6 V.D.C., Elect.
10	(C12)	100 119	Capacitor, 50 Mfd., 6 V.D.C., Elect.
11	(C13)	100 195	Capacitor, .03 Mfd., 200 V.D.C.
12	(C2)	100 150	Capacitor, .1 Mfd., 200 V.D.C.
13	(C3)	100 150	Capacitor, .1 Mfd., 200 V.D.C.
14	(C4)	100 150	Capacitor, .1 Mfd., 200 V.D.C.
15		150 368	Jack, One Normally Closed Circuit, 2 Conductor
		250 106	Washer, Shoulder, .375 I.D. x $\frac{3}{4}$ O.D.
		250 107	Washer, Flat, .375 I.D. x $\frac{3}{4}$ O.D.
16	(C1)	100 150	Capacitor, .1 Mfd., 200 V.D.C.
17	(C14)	100 164	Capacitor, .01 Mfd., 600 V.D.C., Disc
18	(C29)	100 196	Capacitor, Dual 40 x 40 Mfd., 250 V. D.C., Elect.
19	(C16)	100 171	Capacitor, .05 Mfd., 400 V.D.C.
20	(C27)	100 103	Capacitor, .05 Mfd., 200 V.D.C.
21	(Z2)	260 348	Rectifier, Selenium, 250 Micro Amp. Maximum Rate Current
22	(Z1)	260 348	Rectifier, Selenium, 250 Micro Amp. Maximum Rate Current
23	(C31)	100 194	Capacitor, .05 Mfd., 200 V.D.C.
24	(C33)	100 194	Capacitor, .05 Mfd., 200 V.D.C.
25	(C32)	100 103	Capacitor, .05 Mfd., 200 V.D.C.
26		090 080	Grommet, Rubber, $\frac{5}{16}$ I.D. x $\frac{5}{8}$ O.D., Mounts in $\frac{3}{8}$ " Hole
27		090 056	Grommet, Rubber, $\frac{3}{8}$ I.D. x $2\frac{1}{32}$ O.D., Mounts in $\frac{3}{8}$ " Hole
28		060 017	Fuse, 3 Amp., 250 Volt, Type 3AG
		060 530	Post, Fuse Holder, Type 3AG
29	(C11)	100 198	Capacitor, .00047 Mfd., 600 V.D.C., Tubular
30	(C19)	100 193	Capacitor, .001 Mfd., 600 V.D.C., Tubular
31	(C15)	100 198	Capacitor, .00047 Mfd., 600 V.D.C., Tubular
32	(C18)	100 164	Capacitor, .01 Mfd., 600 V.D.C., Disc
33	(C30)	100 197	Capacitor, Dual 40 x 40 Mfd., 450 V.D.C., Elect.
34	(C21)	100 149	Capacitor, .01 Mfd., 600 V.D.C., Disc
35	(C20)	100 202	Capacitor, .022 Mfd., 400 V.D.C.
36		220 289	Screw, Binding Head, 8 - 32 x $\frac{5}{16}$
		250 144	Washer, Flat, #8
		090 180	Washer, Lock, #8
37		090 090	Clamp, Cable
38	(C22)	100 236	Capacitor, .0008 Mfd., 600 V.D.C., Disc
39	(C23)	100 200	Capacitor, .0001 Mfd., 600 V.D.C., Tubular
40	(C17)	100 199	Capacitor, .00015 Mfd., 600 V.D.C., Tubular
41	(C24)	100 164	Capacitor, .01 Mfd., 600 V.D.C., Disc
42		150 368	Jack, One Normally Closed Circuit, 2 Conductor
		250 106	Washer, Shoulder, .375 I.D. x $\frac{3}{4}$ O.D.
		250 107	Washer, Flat, .375 I.D. x $\frac{3}{4}$ O.D.
43	(C26)	100 193	Capacitor, .001 Mfd., 600 V.D.C., Tubular
44	(C25)	100 193	Capacitor, .001 Mfd., 600 V.D.C., Tubular
45	(C34)	100 141	Capacitor, .001 Mfd., 600 V.D.C., Tubular



BOTTOM AMPLIFIER CHASSIS ASSEMBLY

p a r t s l i s t 7

Item Number	Part Number		Description
1 (R41)	210	445	Resistor, 7,500 Ohms, $\frac{1}{2}$ W
2 (R43)	210	434	Resistor, 15,000 Ohms, $\frac{1}{2}$ W
3 (R42)	210	438	Resistor, 22,000 Ohms, $\frac{1}{2}$ W
4 (R39)	210	449	Resistor, 2,500 Ohms, 20 W
5 (R14)	210	106	Resistor, 240,000 Ohms, $\frac{1}{2}$ W
6 (R13)	210	450	Resistor, 1.2 Meg. Ohms, $\frac{1}{2}$ W
7 (R15)	210	107	Resistor, 470,000 Ohms, $\frac{1}{2}$ W
8 (R10)	210	433	Resistor, 18,000 Ohms, $\frac{1}{2}$ W
9 (R12)	210	443	Resistor, 3,900 Ohms, $\frac{1}{2}$ W
10 (R18)	210	434	Resistor, 15,000 Ohms, $\frac{1}{2}$ W
11 (R17)	210	464	Resistor, 3,300 Ohms, $\frac{1}{2}$ W
12 (R21)	210	444	Resistor, 1,500 Ohms, $\frac{1}{2}$ W
13 (R22)	210	107	Resistor, 470,000 Ohms, $\frac{1}{2}$ W
14 (R23)	210	148	Resistor, 1,500 Ohms, $\frac{1}{2}$ W
15 (R19)	210	435	Resistor, 750 Ohms, $\frac{1}{2}$ W
16 (R7)	210	442	Resistor, 100 Ohms, $\frac{1}{2}$ W
17 (R9)	210	122	Resistor, 270 Ohms, $\frac{1}{2}$ W
18 (R4)	210	464	Resistor, 3,300 Ohms, $\frac{1}{2}$ W
19 (R3)	210	464	Resistor, 3,300 Ohms, $\frac{1}{2}$ W
20 (R5)	210	441	Resistor, 2,700 Ohms, $\frac{1}{2}$ W
21 (R6)	210	441	Resistor, 2,700 Ohms, $\frac{1}{2}$ W
22 (R2)	210	150	Resistor, 47,000 Ohms, $\frac{1}{2}$ W
23 (R1)	210	150	Resistor, 47,000 Ohms, $\frac{1}{2}$ W
24 (R44)	210	437	Resistor, 10,000 Ohms, $\frac{1}{2}$ W
25 (R38)	210	439	Resistor, 22,000 Ohms, $\frac{1}{2}$ W
26 (R45)	210	436	Resistor, 12,000 Ohms, $\frac{1}{2}$ W
27 (R40)	210	226	Resistor, 250 Ohms, 5 W
28 (R33)	210	447	Resistor, 2.7 Ohms, 2 W
29 (R31)	210	452	Potentiometer, 20,000 Ohms, Linear Taper
30 (R16)	210	106	Resistor, 240,000 Ohms, $\frac{1}{2}$ W
31 (R29)	210	448	Resistor, 100,000 Ohms, $\frac{1}{2}$ W
32 (R30)	210	138	Resistor, 1,000 Ohms, $\frac{1}{2}$ W
33	170	136	Coil, Bias Oscillator
34 (R37)	210	150	Resistor, 47,000 Ohms, $\frac{1}{2}$ W
35 (R26)	210	446	Resistor, 270 Ohms, 2 W
36 (R32)	210	105	Resistor, 100,000 Ohms, $\frac{1}{2}$ W
37 (R27)	210	150	Resistor, 47,000 Ohms, $\frac{1}{2}$ W
38	411	007	Mounting, Motor
39 (R34)	210	107	Resistor, 470,000 Ohms, $\frac{1}{2}$ W
40 (R28)	210	106	Resistor, 240,000 Ohms, $\frac{1}{2}$ W
41 (R35)	210	150	Resistor, 47,000 Ohms, $\frac{1}{2}$ W
42 (R25)	210	107	Resistor, 470,000 Ohms, $\frac{1}{2}$ W
43 (R11)	210	200	Resistor, 1.5 Meg. Ohms, $\frac{1}{2}$ W
44 (R36)	210	163	Resistor, 3.3 Meg. Ohms, $\frac{1}{2}$ W
45 (R24)	210	106	Resistor, 240,000 Ohms, $\frac{1}{2}$ W
46 (R20)	210	106	Resistor, 240,000 Ohms, $\frac{1}{2}$ W



BOTTOM AMPLIFIER CHASSIS ASSEMBLY - Continued

NOTE

WE ARE AT PRESENT IN A TRANSITION PERIOD
WHERE SLEEVE TYPE MOTOR PART NUMBER 411 075
IS BEING REPLACED BY BALL BEARING TYPE MOTOR
PART NUMBER 411 266.

TO IDENTIFY THE NEW MOTOR, MOTOR PART NUMBER
411 266 HAS NO THRUST BEARING ADJUSTMENT AND
LUBRICATION HOLES, BECAUSE OF SEALED BEARINGS,
LUBRICATION WILL NOT BE NECESSARY.

MACHINES WITH THE LETTER "B" STAMPED ON NAME-
PLATE HAVE THE NEW TYPE MOTOR PART NUMBER
411 266.

SECTION 3

ALPHABETICAL PARTS REFERENCE INDEX

Part Number		Description	Item	Page
411	228	Assembly, Bottom (Less Rubber Feet)	21	7
411	227	Assembly, Top (Less Footman's Loop and Handle)	15	7
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260	237	Ball, Steel, $\frac{5}{32}$ " Diameter (Worm Drive Shaft)	13	13
411	176	Base Assembly, Power Transformer	15	15
411	013	Bearing Assembly, Spindles	6	9
			46	13
411	091	Bearing, Mounting and Bearing Assembly	20	9
411	071	Bearing, Tuner Control	53	13
411	158	Bracket, Hinge, Ramp Assembly	29	9
411	221	Bracket, Left Hand, Rack Mounting	2	7
411	222	Bracket, Right Hand, Rack Mounting	26	7
411	159	Bridge Assembly, Gate Assembly	26	9
411	205	Brush and Lead Assembly, Magnetic Recording Wheel	23	9
411	182	Bushing, Hex, 8 - 32 x $\frac{3}{4}$ " Long	11	15
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411	226	Cabinet Assembly (Less Rubber Feet)	1	7
411	006	Cable Assembly, Power	3	17
411	118	Cam and Hub Assembly (Less #8 Allen Set Screw)	25	11
			30	11
100	200	Capacitor, .0001 Mfd., 600 V.D.C., Tubular	39	17
100	199	Capacitor, .00015 Mfd., 600 V.D.C., Tubular	40	17
100	198	Capacitor, .00047 Mfd., 600 V.D.C., Tubular	5	17
			29	17
			31	17
100	236	Capacitor, .0008 Mfd., 600 V.D.C., Disc	38	17
100	193	Capacitor, .001 Mfd., 600 V.D.C., Tubular	30	17
			43	17
			44	17
100	204	Capacitor, .003 Mfd., 600 V.D.C., Tubular	4	17
100	203	Capacitor, .005 Mfd., 600 V.D.C., Disc	8	17
100	149	Capacitor, .01 Mfd., 600 V.D.C., Disc	7	17
			34	17
100	164	Capacitor, .01 Mfd., 600 V.D.C., Disc	17	17
			32	17
			41	17
100	202	Capacitor, .022 Mfd., 400 V.D.C.	35	17
100	141	Capacitor, .001 Mfd., 600 V.D.C., Tubular	45	17
100	233	Capacitor, .25 Mfd., 400 V.D.C.	44	15

SECTION III. ALPHABETICAL PARTS REFERENCE INDEX

Part Number		Description	Item	Page
100	195	Capacitor, .03 Mfd., 200 V.D.C	11	17
100	103	Capacitor, .05 Mfd., 200 V.D.C.	20	17
			25	17
100	194	Capacitor, .05 Mfd., 200 V.D.C.	23	17
			24	17
100	171	Capacitor, .05 Mfd., 400 V.D.C.	19	17
100	150	Capacitor, .1 Mfd., 200 V.D.C.	12	17
			13	17
			14	17
			16	17
100	165	Capacitor, .25 Mfd., Metalized Paper, 200 V.D.C.	6	17
100	201	Capacitor, 1.50 Mfd., 330 VAC, Can Type, Cornell	5	15
		Dubilier, Motor Start	1	17
100	196	Capacitor, Dual 40 x 40 Mfd., 250 V.D.C., Elect.	24	15
			18	17
100	197	Capacitor, Dual 40 x 40 Mfd., 450 V.D.C., Elect.	21	15
			33	17
100	119	Capacitor, 50 Mfd., 6 V.D.C., Elect.	9	17
			10	17
411	119	Casing, Front Panel	22	11
260	361	Catch, Top and Bottom Cover	16	7
			22	7
090	090	Clamp, Cable	37	17
170	136	Coil, Bias Oscillator	33	19
411	011	Coupling, Flexible, 10 - 32 Left Hand Threads (30 R.P.M. Drive Gear)	1	13
411	012	Coupling, Flexible, 10 - 32 Right Hand Threads (Worm Drive Shaft)	34	13
			36	13
411	181	Cover, Transformer Shield	14	15
411	080	Crank Assembly, Reel (Includes Knob and Retaining Ring)	7	7
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411	063	Dog, Roller, Spur Gear, Drive Roller and Shaft Assembly	44	13
411	066	Drive Roller and Shaft Assembly	39	11
			26	13
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411	135	Elevator Arm Assembly	1	11
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411	162	Finger, Elevator Arm Assembly	15	11
411	040	Flywheel and Shaft Assembly	27	9
260	149	Foot, Rubber	19	7
			32	7
060	017	Fuse, 3 Amp., 250 Volt, Type 3AG	16	15
			28	17
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411	051	Gasket, Screw Plug Assembly	25	13

Part Number	Description	Item	Page
411 055	Gasket, Thrust Screw Assembly	21	13
411 088	Gear Box and Bearing Assembly	28	13
411 197	Gear, Drive, 30 R.P.M.	3	13
411 085	Gear, Intermediate Spur, Tuner Lever Assembly	14	13
411 183	Gear and Shaft Assembly	22	13
411 024	Gear, Spur	15	13
411 061	Gear, Spur, Drive Roller and Shaft Assembly	45	13
090 806	Grommet, Rubber, $\frac{3}{32}$ " I.D. x $\frac{5}{16}$ " O.D., Mounts in $\frac{3}{16}$ " Hole	30	15
260 223	Grommet, Rubber, $\frac{3}{16}$ " I.D. x $\frac{1}{2}$ " O.D., Mounts in $\frac{5}{16}$ " Hole	6	15
090 080	Grommet, Rubber, $\frac{5}{16}$ " I.D. x $\frac{5}{8}$ " O.D., Mounts in $\frac{3}{8}$ " Hole	43	9
		37	15
		26	17
090 056	Grommet, Rubber, $\frac{3}{8}$ " I.D. x $\frac{21}{32}$ " O.D., Mounts in $\frac{3}{8}$ " Hole	27	17
411 239	Guard, Flywheel	2	9
411 124	Guide, Front Tape	25	9
411 081	Guide, Tape	33	9
411 128	Guide, Tape, Gate Assembly	37	9
411 213	Handle, Top Cover	10	7
150 368	Jack, One Normally Closed Circuit, 2 Conductor	33	15
		42	15
		15	17
		42	17
150 149	Jack, Open Circuit, 2 Conductor (Monitor)	7	11
260 235	Knob, Long, With #8 Allen Set Screw	11	11
		13	11
411 064	Knob, Reel Crank	8	7
260 236	Knob, Round, With #8 Allen Set Screw	10	11
240 319	Lamp, Incandescent, Westinghouse #1815, 12 Volts, 20 Amp., Bayonette Type	6	11
240 313	Lamp, Neon, Type NE-51, 105-125 Volts, Bayonette Type	8	11
411 165	Lever, Tuning	32	13
411 214	Loop, Footman's (Handle)	9	7
411 093	Magnetic Recording Wheel Assembly (Including #8 Allen Set Screw)	52	9
411 079	Mandrel Assembly, Reels (Less #8 Allen Set Screw)	61	13
411 075	Motor, Synchronous, Howard Industries Type SWC-9206-1, 115 Volts, 60 Cycles, 1800 R.P.M.	37	13
411 037	Mounting and Bearing Assembly	11	9

SECTION III. ALPHABETICAL PARTS REFERENCE INDEX

Part Number		Description	Item	Page
411	007	Mounting, Motor	38	19
411	048	Nut, Crown, 6 - 32	20	11
190	188	Nut, ESNA Hex, 6 - 32	19	11
190	189	Nut, ESNA Hex, $\frac{1}{4}$ - 28	58	13
090	032	Nut, Hex, 3 - 48	32	15
			41	15
090	529	Nut, Hex, 4 - 40	30	15
090	047	Nut, Hex, 6 - 32	17	7
			28	11
			7	15
190	112	Nut, Hex, 10 - 32	14	7
			49	13
190	187	Nut, Hex, $\frac{5}{8}$ - 18	4	9
			41	13
			51	13
411	083	Outboard Bearing Assembly	10	13
411	522	Panel Assembly, Front	5	11
150	177	Pilot Light Assembly, Clear (Recording Level Indicator)	8	11
150	176	Pilot Light Assembly, Green (Power Indicator)	4	11
120	209	Pin, Roll, .066" Diameter x $\frac{3}{8}$ Long	59	13
411	217	Plate, Nut (Rear Screen)	40	15
411	215	Post, 8 - 32 Threads (Handle)	11	7
060	530	Post, Fuse Holder, Type 3AG	16	15
			28	17
411	028	Post Assembly, Guide	10	9
			56	13
210	452	Potentiometer, 20,000 Ohms, Linear Taper	22	15
			29	19
210	451	Potentiometer, Dual W/Switch, Front Section 500,000 Ohms, Rear Section 5,000 Ohms	24	11
			2	15
411	521	Pressure Roller Unit Assembly	37	11
411	062	Pulley, Drive Roller and Shaft Assembly (Less #8 Allen Set Screw)	38	13
411	160	Ramp, Ramp Assembly	30	9
411	149	Ramp Stop Assembly	32	9
150	369	Receptacle, Power, Twist-Lock	17	15
			2	17
260	348	Rectifier, Selenium, 250 Micro Amp. Maximum Rated Current	21	17
			22	17

Part Number	Description	Item	Page
411 106	Reel Assembly, 3 $\frac{1}{4}$ " Diameter	5	7
210 447	Resistor, 2.7 Ohms, 2W	28	19
210 442	Resistor, 100 Ohms, $\frac{1}{2}$ W	16	19
210 122	Resistor, 270 Ohms, $\frac{1}{2}$ W	17	19
210 226	Resistor, 250 Ohms, 5 W	27	19
		35	19
210 435	Resistor, 750 Ohms, $\frac{1}{2}$ W	15	19
210 148	Resistor, 1,500 Ohms, $\frac{1}{2}$ W	14	19
210 444	Resistor, 1,500 Ohms, $\frac{1}{2}$ W	12	19
210 449	Resistor, 2,500 Ohms, 20 W	4	19
210 441	Resistor, 2,700 Ohms, $\frac{1}{2}$ W	20	19
		21	19
210 464	Resistor, 3,300 Ohms, $\frac{1}{2}$ W	11	19
		18	19
		19	19
210 443	Resistor, 3,900 Ohms, $\frac{1}{2}$ W	9	19
210 445	Resistor, 7,500 Ohms, $\frac{1}{2}$ W	1	19
210 437	Resistor, 10,000 Ohms, $\frac{1}{2}$ W	24	19
210 436	Resistor, 12,000 Ohms, $\frac{1}{2}$ W	26	19
210 434	Resistor, 15,000 Ohms, $\frac{1}{2}$ W	2	19
		10	19
210 138	Resistor, 1,000 Ohms, $\frac{1}{2}$ W	32	19
210 433	Resistor, 18,000 Ohms, $\frac{1}{2}$ W	8	19
210 438	Resistor, 22,000 Ohms, $\frac{1}{2}$ W	3	19
210 439	Resistor, 22,000 Ohms, $\frac{1}{2}$ W	25	19
210 150	Resistor, 47,000 Ohms, $\frac{1}{2}$ W	22	19
		23	19
		34	19
		37	19
		41	19
210 448	Resistor, 100,000 Ohms, $\frac{1}{2}$ W	31	19
210 106	Resistor, 240,000 Ohms, $\frac{1}{2}$ W	5	19
		30	19
		40	19
		45	19
		46	19
210 105	Resistor, 100,000 Ohms, $\frac{1}{2}$ W	7	19
		13	19
		36	19
		39	19
		42	19
210 450	Resistor, 1.2 Meg. Ohms, $\frac{1}{2}$ W	6	19
210 200	Resistor, 1.5 Meg. Ohms, $\frac{1}{2}$ W	43	19
210 163	Resistor, 3.3 Meg. Ohms, $\frac{1}{2}$ W	44	19
120 144	Ring, Retaining, "E" 5133-9	12	9
		34	9
120 126	Ring, Retaining, "E" 5133-18	11	13
210 484	Resistor, 15 Ohms, $\frac{1}{2}$ W	45	15
210 133	Resistor, 33 Ohms, $\frac{1}{2}$ W	46	15

SECTION III. ALPHABETICAL PARTS REFERENCE INDEX

Part Number		Description	Item	Page
120	161	Ring, Retaining, "E" 5133-62	6	7
411	039	Ring, Tape Guide (Outboard Bearing Assembly)	7	13
411	129	Rod, Ramp Assembly	34	9
411	111	Roller Assembly, Pressure, Rubber	41	11
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411	218	Screen, Rear	43	15
411	242	Screen, Speaker	9	15
091	133	Screw, Allen Set, 8 - 32 x $\frac{3}{16}$ "	9	11
			14	11
			12	13
			40	13
220	194	Screw, Allen Set, 8 - 32 x $\frac{1}{4}$ "	51	9
			26	11
			35	11
			31	13
			62	13
411	049	Screw Assembly, Plug	24	13
411	052	Screw Assembly, Thrust	23	13
090	690	Screw, Binding Hd., #6 Self-Tapping	19	15
220	284	Screw, Binding Hd., 6 - 32 x $\frac{5}{16}$ "	15	9
			22	9
			41	9
			45	9
			50	9
			17	11
			6	13
			7	15
220	128	Screw, Binding Hd., 6 - 32 x $\frac{1}{2}$ "	7	9
			9	9
			23	11
			9	13
			29	13
			54	13
			6	15
220	289	Screw, Binding Hd., 8 - 32 x $\frac{5}{16}$ "	10	15
			36	17
220	308	Screw, Binding Hd., 8 - 32 x $\frac{3}{8}$ "	4	7
			27	7
220	290	Screw, Binding Hd., 8 - 32 x $\frac{1}{2}$ "	31	7
220	134	Screw, Fillister Hd., 4 - 40 x $\frac{5}{8}$ "	30	15
220	301	Screw, Oval Hd., 10 - 32 x $\frac{3}{8}$ "	12	7
220	287	Screw, Rd. Hd., 0 - 80 x $\frac{1}{8}$ "	47	9
091	179	Screw, Rd. Hd., 3 - 48 x $\frac{3}{16}$ "	35	9
			36	9
090	065	Screw, Rd. Hd., 3 - 48 x $\frac{1}{4}$ "	32	15
			41	15

Part Number	Description	Item	Page
220 110	Screw, Rd. Hd., 4 - 40 x $\frac{1}{2}$ "	18	9
090 046	Screw, Rd. Hd., 6 - 32 x $\frac{1}{4}$ "	33	7
		16	9
		54	9
		34	11
		18	15
		28	15
		34	15
		38	15
090 183	Screw, Rd. Hd., 6 - 32 x $\frac{3}{8}$ "	20	7
		23	7
060 048	Screw, Rd. Hd., 6 - 32 x $\frac{1}{2}$ "	31	9
220 295	Screw, Slotted Hd., 4 - 40 x $\frac{1}{4}$ "	1	9
220 291	Screw, Slotted Hd., 6 - 32 x 1 $\frac{1}{4}$ "	27	11
411 216	Screw, Truss Hd., 8 - 32 x $\frac{3}{8}$ " (Handle)	11	7
411 524	Shaft, Drive, Worm (With 260 237 Steel Ball)	33	13
411 008	Shaft, Intermediate	35	13
411 170	Shaft Assembly, Controls	2	11
411 188	Shaft Assembly, Eccentric, Tuning Lever	55	13
411 092	Shaft Assembly, Feed Reel	8	9
411 056	Shaft Assembly, Take-Up Reel	48	13
411 127	Shield, Gate Assembly	14	9
411 140	Shield, Rear	44	9
260 313	Shield, Tube, Miniature Type	25	15
411 172	Shield Assembly, Bottom	24	9
411 178	Shield Assembly, Power Transformer	13	15
411 145	Shoe Assembly, Gate Assembly	38	9
411 095	Slip Rings, Printed Circuit, Magnetic Recording Wheel Assembly	48	9
260 359	Spacer, .144 I.D. x .203 O.D., $1\frac{17}{64}$ " Long	6	15
411 154	Spacer, Fiber, Magnetic Recording Wheel Assembly	46	9
230 104	Speaker, 3", Oxford #3CM-25	8	15
411 202	Spring, Elevator Arm Assembly	16	11
411 132	Spring, Gate Shoe	19	9
411 072	Spring, Pressure Roller Unit Assembly	29	11
411 200	Spring, Ramp Assembly	42	9
411 078	Spring, Roller Dog	2	13
411 203	Spring Belt, Take-Up Reel	39	13
260 362	Strike, Cabinet Assembly	29	7
130 130	Switch, Selector, 9 Poles, 3 Poles/Deck, 3 Decks, 2 Decks Non Shorting, One Deck Shorting, 30° Indexing	3	11
		20	15
130 131	Switch, Slide (AVC Switch), SPST	39	15
150 184	Terminal Strip, 4 Lugs	35	15
170 100	Transformer, Input, 50,000 Ohm Primary Impedance, 50 Ohm Secondary Impedance	31	15

SECTION III. ALPHABETICAL PARTS REFERENCE INDEX

Part Number	Description	Item	Page
170 142	Transformer, Input, Triad #40092, 150 Ohm Primary Impedance, 60,000 Ohm Secondary Impedance	26	15
170 143	Transformer, Output, Chicago Type A-3877, 5000 Ohm Primary Impedance, 4 Ohm Nominal Secondary Impedance	36	15
170 138	Transformer, Power, 350-0-350 Volt At .070 Amp. Secondary Winding, 6.3 V.C.T. Secondary Winding, 115 Volt, 60 Cycle Primary Winding	12	15
260 160	Tube Retainer	1	15
		23	15
240 144	Tube, Vacuum, 6AQ5	23	15
240 145	Tube, Vacuum, 6X4	3	15
240 123	Tube, Vacuum, 12AT7	4	15
		25	15
		27	15
411 073	Tuner Lever Assembly	18	13
250 125	Washer, Fiber, .515 I.D. x $\frac{7}{8}$ " O.D.	12	11
250 352	Washer, Flat, .183 I.D. x $\frac{3}{8}$ " O.D.	40	11
		42	11
		16	13
		17	13
		20	13
250 356	Washer, Flat, .252 I.D. x $\frac{1}{2}$ " O.D.	21	9
		28	9
		31	11
		32	11
		36	11
		38	11
		4	13
		19	13
		27	13
		47	13
		50	13
		57	13
409 043	Washer, Flat, .260 I.D. x $\frac{11}{16}$ " O.D.	3	9
		42	13
		60	13
250 107	Washer, Flat, .375 I.D. x $\frac{3}{4}$ " O.D.	12	11
		33	15
		42	15
		15	17
		42	17
250 115	Washer, Flat, #3	13	9
250 322	Washer, Flat, #4	18	9
		30	15
090 069	Washer, Flat, #6	25	7

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090	069	Washer, Flat, #6	22	9
			39	9
			17	11
			18	11
			6	15
			29	15
250	144	Washer, Flat, #8	36	17
250	355	Washer, Internal Star Lock, $\frac{5}{8}$ " Bolt Size	5	9
			43	13
			52	13
090	176	Washer, Lock, #3	35	9
			36	9
			32	15
			41	15
090	528	Washer, Lock, #4	18	9
090	048	Washer, Lock, #6	18	7
			24	7
			7	9
			9	9
			15	9
			17	9
			22	9
			40	9
			45	9
			49	9
			53	9
			17	11
			21	11
			23	11
			28	11
			33	11
			5	13
			8	13
			30	13
			54	13
			6	15
			7	15
			18	15
			34	15
			38	15
090	180	Washer, Lock, #8	3	7
			28	7
			30	7
			10	15
			36	17
090	020	Washer, Lock, #10	13	7
			49	13
250	106	Washer, Shoulder, .375 I.D. x $\frac{3}{4}$ " O.D.	12	11
			33	15
			42	15
			15	17
			42	17
250	349	Washer, Spring, .252 I.D. x $\frac{1}{2}$ " O.D.	50	13

(SECTION 4)

NUMERICAL INDEX

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060 017	16	15	090 048	18	15
060 017	28	17	090 048	34	15
060 048	31	9	090 048	38	15
060 530	16	15	090 056	27	17
060 530	28	17	090 065	32	15
			090 065	41	15
090 020	13	7	090 069	25	7
090 020	49	13	090 069	22	9
090 032	32	15	090 069	39	9
090 032	41	15	090 069	17	11
090 046	33	7	090 069	18	11
090 046	16	9	090 069	6	15
090 046	54	9	090 069	29	15
090 046	34	11	090 080	43	9
090 046	18	15	090 080	37	15
090 046	28	15	090 080	26	17
090 046	34	15	090 090	37	17
090 046	38	15	090 176	35	9
090 047	17	7	090 176	36	9
090 047	28	11	090 176	32	15
090 047	7	15	090 176	41	15
090 048	18	7	090 180	3	7
090 048	24	7	090 180	28	7
090 048	7	9	090 180	30	7
090 048	9	9	090 180	10	15
090 048	15	9	090 180	36	17
090 048	17	9	090 183	20	7
090 048	22	9	090 183	23	7
090 048	40	9	090 528	18	9
090 048	45	9	090 529	30	15
090 048	49	9	090 690	19	15
090 048	53	9	090 806	30	15
090 048	17	11	091 133	9	11
090 048	21	11	091 133	14	11
090 048	23	11	091 133	12	13
090 048	28	11	091 133	40	13
090 048	33	11	091 179	35	9
090 048	5	13	091 179	36	9
090 048	8	13			
090 048	30	13	100 103	20	17
090 048	54	13	100 103	25	17
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100 150	16	17	170 136	33	19
100 164	17	17	170 138	12	15
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100 165	6	17			
100 171	19	17	190 112	14	7
100 193	30	17	190 112	49	13
100 193	43	17	190 187	4	9
100 193	44	17	190 187	41	13
100 194	23	17	190 187	51	13
100 194	24	17	190 188	19	11
100 195	11	17	190 189	58	13
100 196	24	15			
100 196	18	17	210 106	5	19
100 197	21	15	210 106	30	19
100 197	33	17	210 106	40	19
100 198	5	17	210 106	45	19
100 198	29	17	210 106	46	19
100 198	31	17	210 107	7	19
100 199	40	17	210 107	13	19
100 200	39	17	210 105	36	19
100 201	5	15	210 107	39	19
100 201	1	17	210 107	42	19
100 202	35	17	210 122	17	19
100 203	8	17	210 148	14	19
100 204	4	17	210 150	22	19
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100 236	38	17	210 150	34	19
120 126	11	13	210 150	37	19
120 144	12	9	210 150	41	19
120 144	34	9	210 163	44	19
120 161	6	7	210 200	43	19
120 209	59	13	210 433	8	19
130 130	3	11	210 434	2	19
130 130	20	15	210 434	10	19
130 131	39	15	210 435	15	19
			210 436	26	19
150 149	7	11	210 437	24	19
150 176	4	11	210 438	3	19
150 177	8	11	210 439	25	19
150 184	35	15	210 440	32	19
150 368	33	15	210 441	20	19
150 368	42	15	210 133	46	15
			210 138	32	19

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210 441	21	19	220 308	4	7
210 442	16	19	220 308	27	7
210 443	9	19			
210 444	12	19	230 104	8	15
210 445	1	19			
210 446	27	19	240 123	4	15
210 226	35	19	240 123	25	15
210 447	28	19	240 123	27	15
210 448	31	19	240 144	23	15
210 449	4	19	240 145	3	15
210 450	6	19	240 313	8	11
210 451	24	11	240 319	6	11
210 451	2	15			
210 452	22	15	250 106	12	11
210 452	29	19	250 106	33	15
210 464	11	19	250 106	42	15
210 464	18	19	250 106	15	17
210 464	19	19	250 106	42	17
210 484	45	15	250 107	12	11
220 110	18	9	250 107	33	15
220 128	7	9	250 107	42	15
220 128	9	9	250 107	15	17
220 128	23	11	250 107	42	17
220 128	9	13	250 115	13	9
220 128	29	13	250 125	12	11
220 128	54	13	250 144	36	17
220 128	6	15	250 322	18	9
220 134	30	15	250 322	30	15
220 194	51	9	250 349	50	13
220 194	26	11	250 352	40	11
220 194	35	11	250 352	42	11
220 194	31	13	250 352	16	13
220 194	62	13	250 352	17	13
220 284	15	9	250 352	20	13
220 284	22	9	250 355	5	9
220 284	41	9	250 355	43	13
220 284	45	9	250 355	52	13
220 284	50	9	250 356	21	9
220 284	17	11	250 356	28	9
220 284	6	13	250 356	31	11
220 284	7	15	250 356	32	11
220 287	47	9	250 356	36	11
220 289	10	15	250 356	38	11
220 289	36	17	250 356	4	13
220 290	31	7	250 356	19	13
220 291	27	11	250 356	27	13
220 295	1	9	250 356	47	13
220 301	12	7	250 356	50	13
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260 149	32	7	411 073	18	13
260 160	1	15	411 075	37	13
260 160	23	15	411 078	2	13
260 223	6	15	411 079	61	13
260 235	11	11	411 080	7	7
260 235	13	11	411 081	33	9
260 236	10	11	411 083	10	13
260 237	13	13	411 085	14	13
260 313	25	15	411 088	28	13
260 348	21	17	411 091	20	9
260 348	22	17	411 092	8	9
260 359	6	15	411 093	52	9
260 361	16	7	411 095	48	9
260 361	22	7	411 106	5	7
260 362	29	7	411 111	41	11
			411 118	25	11
409 043	3	9	411 118	30	11
409 043	42	13	411 119	22	11
409 043	60	13	411 124	25	9
			411 127	14	9
411 006	3	17	411 128	37	9
411 007	38	19	411 129	34	9
411 008	35	13	411 132	19	9
411 011	1	13	411 135	1	11
411 012	34	13	411 140	44	9
411 012	36	13	411 145	38	9
411 013	6	9	411 149	32	9
411 013	46	13	411 154	46	9
411 024	15	13	411 158	29	9
411 028	10	9	411 159	26	9
411 028	56	13	411 160	30	9
411 037	11	9	411 162	15	11
411 039	7	13	411 165	32	13
411 040	27	9	411 170	2	11
411 048	20	11	411 172	24	9
411 049	24	13	411 176	15	15
411 051	25	13	411 178	13	15
411 052	23	13	411 181	14	15
411 055	21	13	411 182	11	15
411 056	48	13	411 183	22	13
411 061	45	13	411 188	55	13
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411 063	44	13	411 200	42	9
411 064	8	7	411 202	16	11
411 066	39	11	411 203	39	13
411 066	26	13	411 205	23	9
411 071	53	13			

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411 214	9	7
411 215	11	7
411 216	11	7
411 217	40	15
411 218	43	15
411 221	2	7
411 222	26	7
411 226	1	7
411 227	15	7
411 228	21	7
411 239	2	9
411 242	9	15
411 246	34	7
411 267	63	13
411 521	37	11
411 522	5	11
411 524	33	13

SECTION XV

NUMERICAL PARTS LIST

DEMAGNETIZER

MECHANICAL

<u>PART NUMBER</u>	<u>DESCRIPTION</u>
060 530	Fuse Holder
090 020	Washer, #10 Split Lock
090 046	Screw, 6-32 X $\frac{1}{4}$ RD, HD, Mach
090 048	Washer #6 Split Lock
090 049	Solder
090 090	Clamp Cable
090 180	Washer #8 Split Lock
090 183	Screw #6 32 X $\frac{3}{8}$ Rd. Hd.
090 362	Lug, Solder
090 700	Screw #8 32 X $\frac{3}{8}$ Rd. Hd.
091 145	"Pilot Bond" Cement
130 319	Switch
150 314	Lamp Socket
150 364	Plug Power
190 112	Hex Nut 10-32
190 141	Nut #8-32 Hex.
220 128	Screw #6 32 X $\frac{1}{2}$ Bind Hd.
220 178	Screw #8 32 X $\frac{7}{16}$ Rd. Hd.
220 236	Screw 32 X $\frac{1}{2}$ Rd. Hd. Mach. (Brass)
220 284	Screw #6 32 X $\frac{5}{16}$ Bind Hd.
240 315	Neon Lamp

MECHANICAL

<u>PART NUMBER</u>	<u>DESCRIPTION</u>
250 309	Washer #6 External Star
250 370	Washer #8 Flat
260 356	Wooden Wedges
411 006	Power Cable Assembly
411 501	Core Angle Channel Assembly
411 506	Terminal Board Assembly
411 508	Strap Assembly Capacitor
411 509	Housing Assembly
411 510	Panel Assembly, Front
411 511	Bottom Assembly
411 514	Insulator.
411 516	Coil
411 518	Deck Assembly
411 519	Harness Assembly
405 298	Foot, Rubber

ELECTRICAL

<u>PART NUMBER</u>	<u>DESCRIPTION</u>
100 313	Capacitor 12 MFD 1000 V.A.C.
130 319	Switch
210 105	100K 1/2 W Resistor
210 494	470K 1 W Resistor
240 315	Neon Lamp
260 318	Fuse Lamp
411 516	Coil

NOTES

Item Number	Part Number	Description
C1	100150	Capacitor, .1 Mfd., 200 VDC
C2	100150	Capacitor, .1 Mfd., 200 VDC
C3	100150	Capacitor, .1 Mfd., 200 VDC
C4	100150	Capacitor, .1 Mfd., 200 VDC
C5	100204	Capacitor, .003 Mfd., 600 VDC, Tubular
C6	100203	Capacitor, .005 Mfd., 600 VDC, Disc
C7	100198	Capacitor, .00047 Mfd., 600 VDC, Tubular
C8	100119	Capacitor, 50 Mfd., 6 VDC, Elect.
C9	100149	Capacitor, .01 Mfd., 600 VDC, Disc
C10	100165	Capacitor, .25 Mfd., Metalized Paper, 200 VDC
C11	100198	Capacitor, .00047 Mfd., 600 VDC, Tubular
C12	100119	Capacitor, 50 Mfd., 6 VDC, Elect.
C13	100195	Capacitor, .03 Mfd., 200 VDC
C14	100164	Capacitor, .01 Mfd., 600 VDC, Disc
C15	100198	Capacitor, .00047 Mfd., 600 VDC, Tubular
C16	100171	Capacitor, .05 Mfd., 400 VDC
C17	100199	Capacitor, .00015 Mfd., 600 VDC, Tubular

Item Number	Part Number	Description
C18	100164	Capacitor, .01 Mfd., 600 VDC, Disc
C19	100193	Capacitor, .001 Mfd., 600 VDC, Tubular
C20	100202	Capacitor, .022 Mfd., 400 VDC
C21	100149	Capacitor, .01 Mfd., 600 VDC, Disc
C22	100236	Capacitor, .0008 Mfd., 600 VDC, Disc
C23	100200	Capacitor, .0001 Mfd., 600 VDC, Tubular
C24	100164	Capacitor, .01 Mfd., 600 VDC, Disc
C25	100193	Capacitor, .001 Mfd., 600 VDC, Tubular
C26	100193	Capacitor, .001 Mfd., 600 VDC, Tubular
C27	100103	Capacitor, .05 Mfd., 200 VDC
C28	100201	Capacitor, 1.5 Mfd., 330 VAC
C29	100196	Capacitor, Dual 40 x 40 Mfd., 250 VDC, Elect.
C30	100197	Capacitor, Dual 40 x 40 Mfd., 450 VDC, Elect.
C31	100194	Capacitor, .05 Mfd., 200 VDC
C32	100103	Capacitor, .05 Mfd., 200 VDC
C33	100194	Capacitor, .05 Mfd., 200 VDC
C34	100141	Capacitor, .001 Mfd., 600 VDC, Tubular
C35	100233	Capacitor, .25 Mfd., 400 VDC, Tubular

Item Number	Part Number	Description
R1	210150	Resistor, 47,000 Ohms, 1/2 W
R2	210150	Resistor, 47,000 Ohms, 1/2 W
R3	210464	Resistor, 3,300 Ohms, 1/2 W
R4	210464	Resistor, 3,300 Ohms, 1/2 W
R5	210441	Resistor, 2,700 Ohms, 1/2 W
R6	210441	Resistor, 2,700 Ohms, 1/2 W
R7	210442	Resistor, 100 Ohms, 1/2 W
R8	210451	Potentiometer, Dual W/Switch, Front Section 500,000 Ohms, Rear Section 5,000 Ohms
R9	210122	Resistor, 270 Ohms, 1/2 W
R10	210433	Resistor, 18,000 Ohms, 1/2 W
R11	210200	Resistor, 1.5 Meg. Ohms, 1/2 W
R12	210443	Resistor, 3,900 Ohms, 1/2 W
R13	210450	Resistor, 1.2 Meg. Ohms, 1/2 W
R14	210106	Resistor, 240,000 Ohms, 1/2 W
R15	210107	Resistor, 470,000 Ohms, 1/2 W
R16	210106	Resistor, 240,000 Ohms, 1/2 W
R17	210464	Resistor, 3,300 Ohms, 1/2 W
R18	210434	Resistor, 15,000 Ohms, 1/2 W
R19	210435	Resistor, 750 Ohms, 1/2 W
R20	210106	Resistor, 240,000 Ohms, 1/2 W
R21	210444	Resistor, 1,500 Ohms, 1/2 W
R22	210107	Resistor, 470,000 Ohms, 1/2 W

Item Number	Part Number	Description
R23	210148	Resistor, 1,500 Ohms, 1/2 W
R24	210106	Resistor, 240,000 Ohms, 1/2 W
R25	210107	Resistor, 470,000 Ohms, 1/2 W
R26	210446	Resistor, 270 Ohms, 2 W
R27	210150	Resistor, 47,000 Ohms, 1/2 W
R28	210106	Resistor, 240,000 Ohms, 1/2 W
R29	210448	Resistor, 100,000 Ohms, 1/2 W
R30	210138	Resistor, 1,000 Ohms, 1/2 W
R31	210492	Potentiometer, 30,000 Ohms
R32	210105	Resistor, 100,000 Ohms, 1/2 W
R33	210447	Resistor, 2.7 Ohms, 2 W
R34	210107	Resistor, 470,000 Ohms, 1/2 W
R35	210150	Resistor, 47,000 Ohms, 1/2 W
R36	210163	Resistor, 3.3 Meg. Ohms, 1/2 W
R37	210150	Resistor, 47,000 Ohms, 1/2 W
R38	210439	Resistor, 22,000 Ohms, 1/2 W
R39	210225	Resistor, 800 Ohms, 10 W
R40	210226	Resistor, 250 Ohm, 5 W
R41	210445	Resistor, 7,500 Ohms, 1/2 W
R42	210438	Resistor, 22,000 Ohms, 1/2 W
R43	210434	Resistor, 15,000 Ohms, 1/2 W
R44	210437	Resistor, 10,000 Ohms, 1/2 W
R45	210436	Resistor, 12,000 Ohms, 1/2 W
R46	210484	Resistor, 15 Ohm, 1/2 W
R47	210133	Resistor, 33 Ohm, 1/2 W

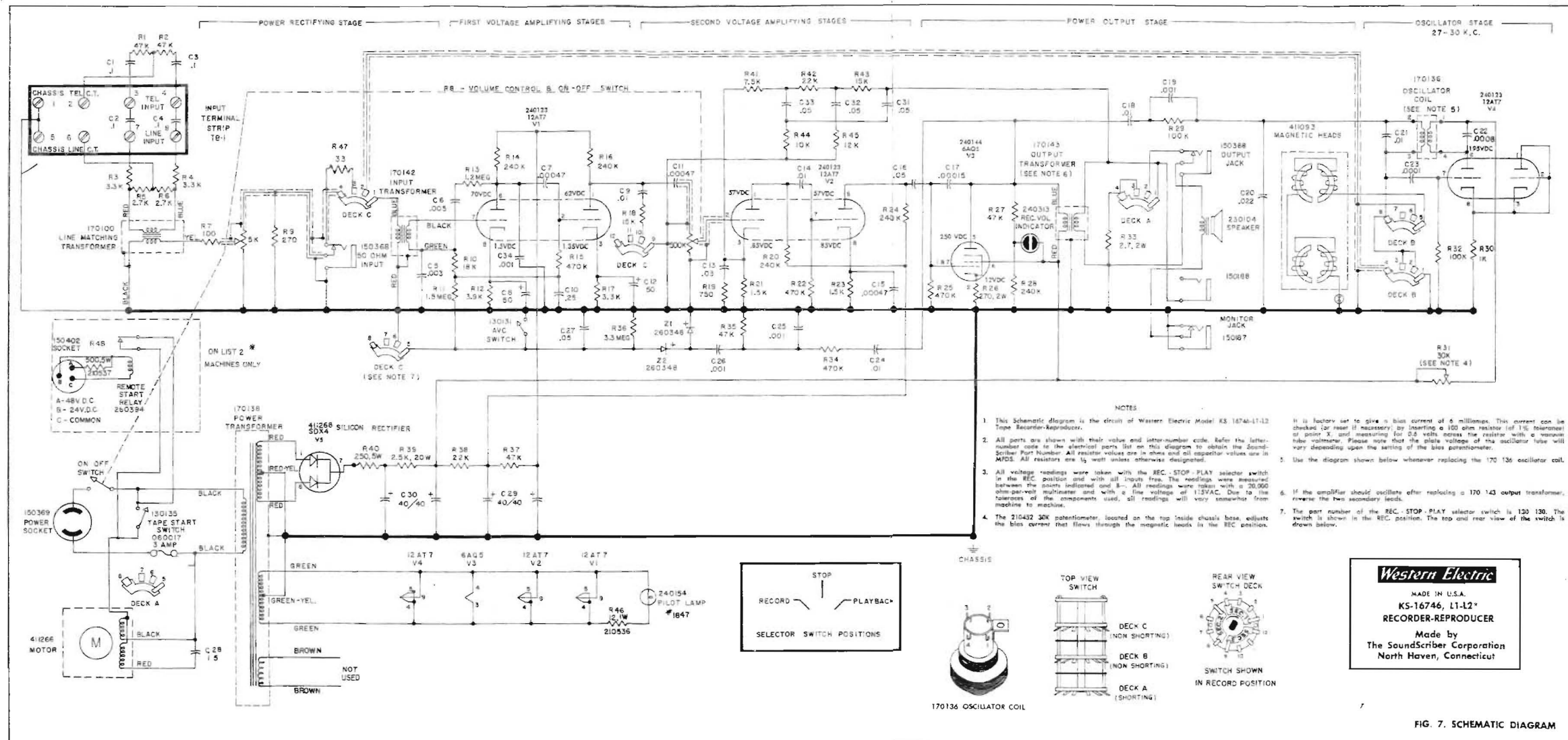


FIG. 7. SCHEMATIC DIAGRAM

Schematic Diagram Part Number 411237 Revised 1/58

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